The Mining Journal

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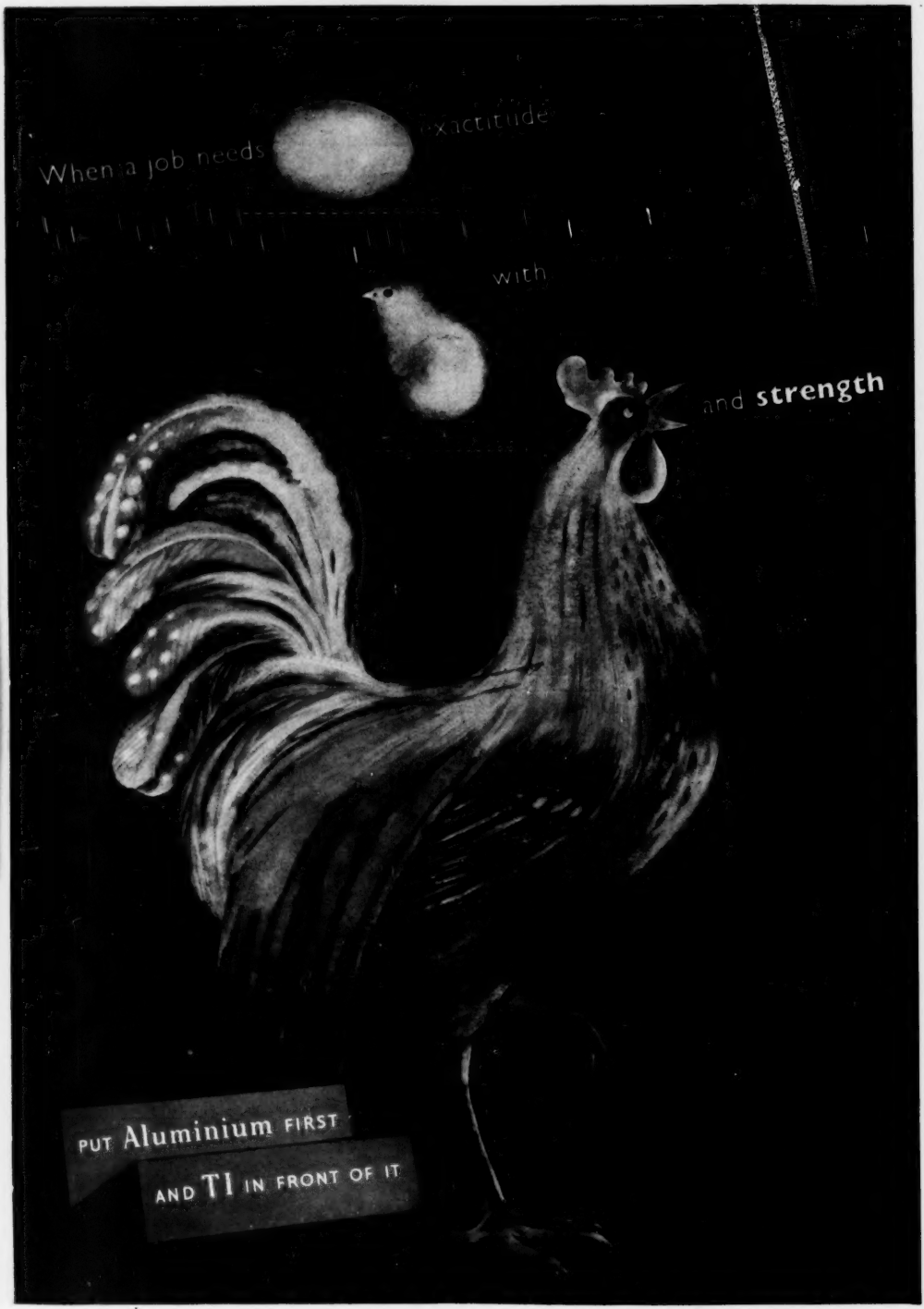

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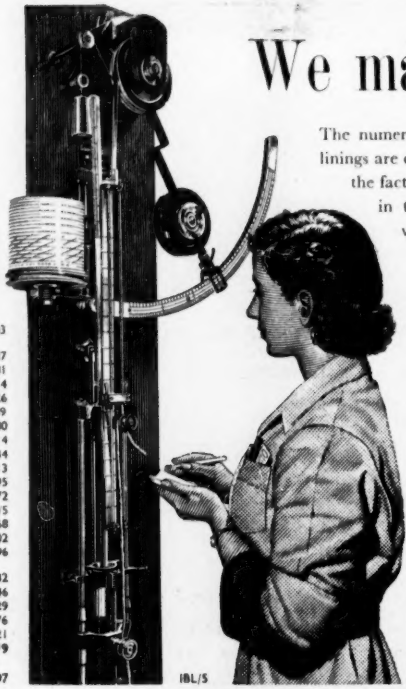

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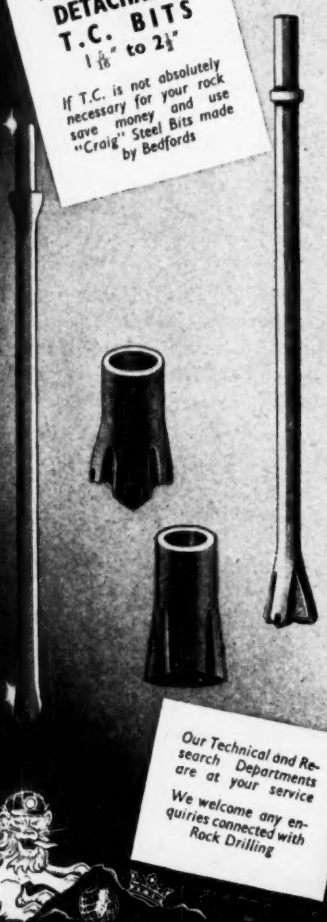

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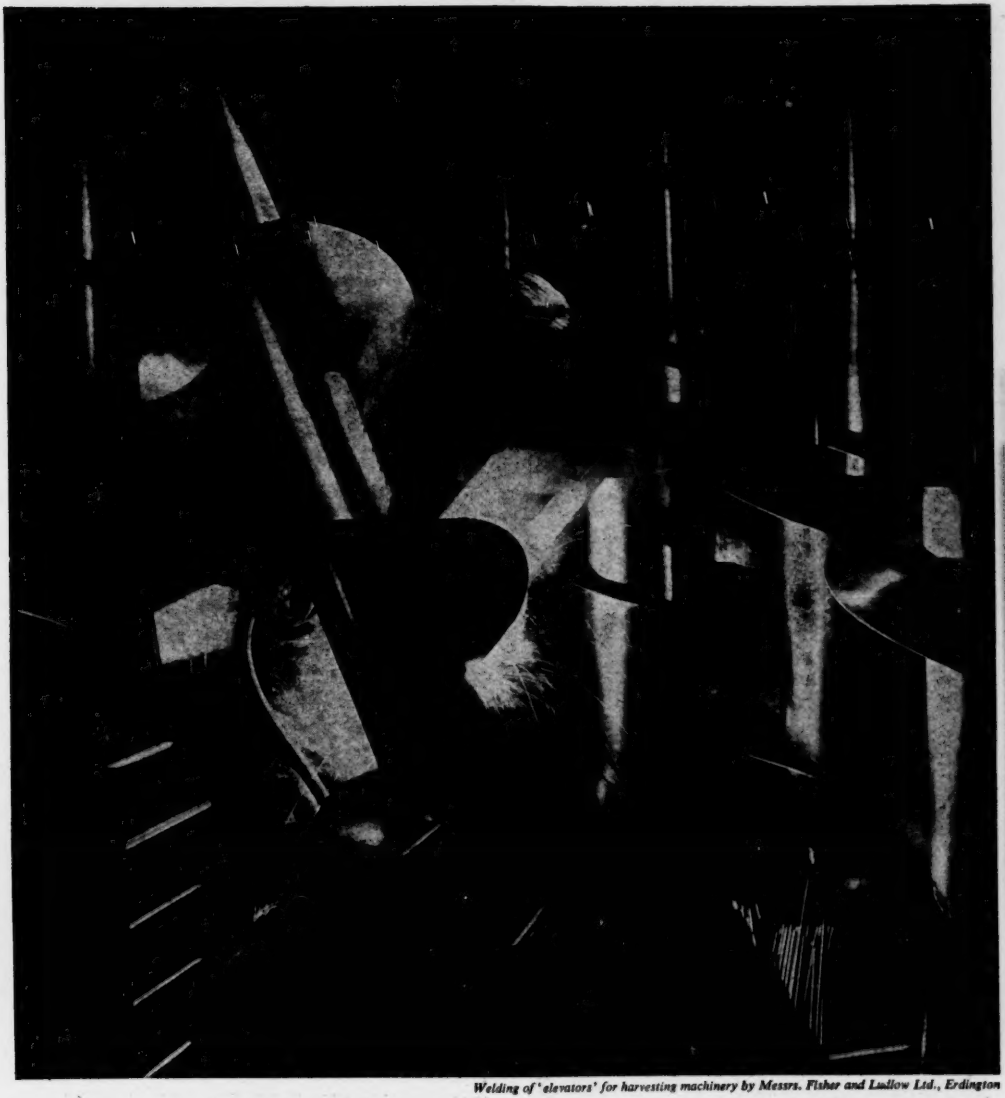

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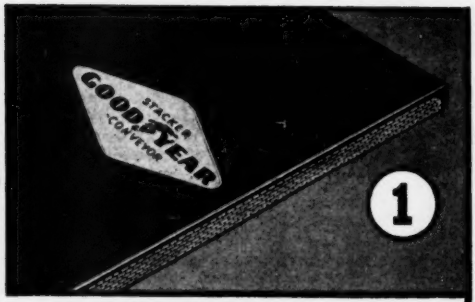

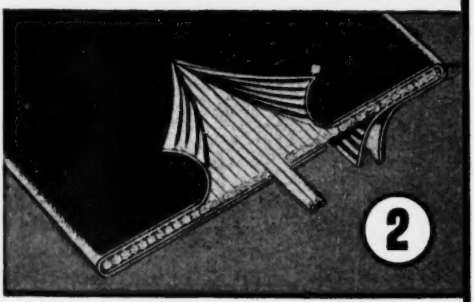

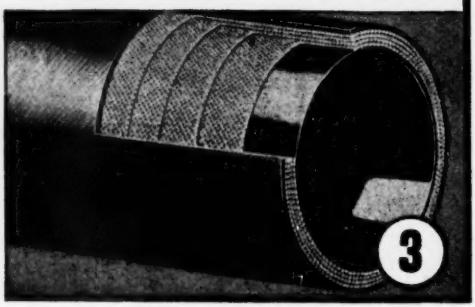

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NOTES AND COMMENTS

Management Training for the Mining Engineer

Mr. J. B. Richardson's paper on the "Status, Training and Vocation of Graduates in Metal Mining" which was discussed at last week's meeting of the Institution of Mining and Metallurgy in London, surveyed the whole problem of higher technical education as applied to the mining engineer. Of particular importance, however, was the opportunity which this paper provided—an opportunity all too rare in the mining industry—for a discussion of one of the urgent problems of our time—the problem of how and when to instruct the trained technologist in methods of business organization and management. It may be added that the urgency of this problem is not lessened by the fact that many people, in metalliferous mining no less than in other industries, are still unaware of the extent to which training for management has become a practical and profitable reality.

The portions of Mr. Richardson's paper dealing with this matter, which are reproduced elsewhere on page 457, pose the problem fairly enough, even if we cannot go all the way with him on some of his proposals. The alarming aspect of the I.M.M.'s discussion last week lies, however, in the fact that, while existence of the problem was admitted specifically or by implication by several speakers, nothing emerged from the discussion to suggest that any specific action is being taken in the matter, either on the academic or on the commercial side of the industry. Indeed, it would appear that even the joint post-graduate course arranged by the Imperial College and the London School of Economics does not at present embrace mining students.

The belief that managers are born, not made, still dies very hard among some of those in the higher ranks of industry who have not themselves been exposed to the modern processes of management training. To such men, who in an earlier generation had to rise to positions of responsibility and leadership unaided by the organized management training available to the modern student, it is natural enough to regard management as a matter of empirical personal experience superimposed on innate qualities of leadership. Nor is it part of modern thinking that these are inessential factors in the proper development of the senior executive or company director.

What is, however, a comparatively new factor in the situation is that the study of management during the past quarter of a century has been brought under the intellectual discipline of those same processes of scientific method which have long been applied to the technical branches of industry. As a result, the know-how of good management has to a considerable extent been codified, and proved methods have been developed of imparting this information to the point where men can be taught—and taught quickly—to become better managers than they would be if left to arrive at the underlying principles of good management by trial and error through their own unaided efforts. As matters stand, however, too many engineers, trained in scientific methods of thought in tackling the technical problems of their profession, are inclined through lack of formal training to revert to a purely empirical approach when, through the normal course of promotion, they come to grapple with the broader problems of business management.

Even in the matter of leadership (which in mining engineering more than in any other branch of engineering is an essential quality) it has been indisputably demonstrated by the British Army that the general level of leadership among regimental officers can be raised by scientific methods of selection and training.

The "born manager" will always remain potentially the better material but the means are now available to enable both he and his less gifted fellows to make the best use of whatever innate abilities they have, and many future managers, otherwise condemned to a lifetime of relative incompetence, can have the opportunity to improve their effectiveness to an extent which even to-day is still appreciated by only a comparatively small number of people in industry.

It should not be necessary to emphasize here that in any industry—most of all perhaps in mining—management

training to be fully effective must be superimposed on a technical competency, and must in no way be regarded as a substitute for lack of technical ability in the particular specialist function in which a student has been trained. It is here that the universities and technical colleges are confronted with their dilemma. The growth of technology is itself demanding more courses and longer training, and on top of this the faculties are now being asked to provide facilities for training in management which in themselves could easily constitute a one-year post-graduate course. It is this dilemma which, in our view, has in no way been solved either by Mr. Richardson's paper or by the discussion which followed it, although the author did pose the question as to when this training should be undergone.

As he rightly points out, a broader study of the humanities by the science student is being increasingly urged. But what is to be the real purpose of this? Is the science student merely to have added to his curriculum instruction in the techniques of psychology, industrial relations and group discussion; or does the call for a broader-based education come, as we believe it does, from a recognition that the modern science student is being taught too much technical know-how and too little about the fundamental processes of logical thought and about social history, without which the later broadening of his mind to keep pace with the broadening of his responsibilities will be handicapped?

If this latter view is the right one, it follows that a course of management training, either as part of a science degree, or even as part of a post-graduate course, can only add to an already overloaded technical syllabus. Moreover, as one speaker in the discussion so rightly pointed out, management training *in vacuo* is largely wasted. Only men who have had practical experience of the functioning of their industry and of their particular company can fully interpret management training in terms of their own experience.

In our view, therefore, everything points to the formal management instruction of the mining engineer being delayed until he has some practical mining experience, thus both relieving the pressure on the graduate syllabus and ensuring that the engineer himself will derive maximum benefit from his management training. To do this, however, transfers the financial responsibility for this further education from the universities and technical colleges onto the mining companies. Some mining companies have already recognized this problem and are taking steps to provide this further instruction, either within their own organizations or through courses such as those provided by the Administrative Staff College at Henley and the Harvard Business School. A great many more are, however, at present doing nothing.

We believe this problem presents a very real challenge to the metalliferous mining industry, as indeed to industry at large. It is one which, sooner or later, will be acepted because the higher productivity which flows from good management will, in a free competitive economy, eventually prove compulsive. It remains to be seen how quickly the mining industry as a whole becomes conscious of this challenge and accepts it.

Mention of the Administrative Staff College, which aims essentially at a course to prepare executives for senior management posts, raises the important point that management training must be progressive and cannot be taken in one dose. Staff officers in the fighting services are provided with the opportunity for going to Staff College courses at several stages in their career and it is probable that formal training for management in the mining industry should occur at least at two stages. First, a course on the elements of the subject comparable in standard to, though narrower in scope than, the syllabus for associate membership of the Institute of Industrial Administration, which would be taken once the student engineer has been at work long enough to familiarize himself with his surroundings and the working of his company, and a second course somewhere between the ages of thirty and forty to which those picked out for promotion to top-level posts in the industry would go for at last six months and where instruction would be largely by the case study method by group discussion and on-the-spot study of the working out of management principles in other industries.

A technical difficulty in the organizing of such courses in the mining industry is inherent in the character of the industry. "Gold is where you find it" and the location of mines is dictated by Nature. How, therefore, are mining groups, which may have young engineers spread over several continents, going to bring them together for periodic courses. The short answer is that they are not. Special circumstances call for special treatment, and except for the very largest corporations, which may have the resources to provide management courses simultaneously on several of the world's mining fields, this is essentially a problem for co-operation within the industry through the organization of regional courses, at any rate so far as the first stage of training is concerned.

It is arguable that the later stage of training for senior management positions should be conducted, not only within reach of head office, but in a sufficiently industrialized country, to give those taking the course an opportunity of studying the application of management principles to industries other than their own, and of exchanging experience with men from these industries. If, for example, it were possible to send a certain number of those selected for advanced training to Henley or Harvard, the period required for the course could take the form of an extension to normal home leave or might even develop into a sabbatical year—in itself no bad thing after ten to fifteen years uninterrupted service in one industry.

As regards the first or elementary stage of training, it should be possible, in the case of the African continent for example, for a small carefully organized team of lecturers to hold four three-month courses a year in, say, West Africa, the Copperbelt, Southern Rhodesia and the Union, although this last has probably a large enough mining industry to support its own permanent teaching staff. Similar travelling teams could operate in Australasia, and in the Far East; *but*—such a scheme does require co-operation. The British Overseas Mining Association has already achieved much good work in inducing co-operative effort in the metalliferous mining industry, and we would in all seriousness commend to its attention this further fruitful field for action.

Planning and Mechanization in the O.F.S. Mines

A high rate of progress is being maintained in the drive to bring the new Orange Free State mines to production as soon as possible. This, writes our South African Correspondent, is all the more essential now in view of the changed complexion of the economic situation in that country and in the world in general. In its broadest aspect, it is highly desirable that the physical output of gold should be increased rapidly. Insofar as individual mines are concerned, as not only is capital in short supply but it is becoming increasingly expensive, the ideal being aimed at is the starting up of milling operations in the minimum time, and meeting as much of future capital expenditure from the profits so earned.

Apart from a number of mines having reached the stage where large-scale underground development can be undertaken, it is this economic factor which is likely to make the current six months of activity on the new goldfields a period of extraordinary interest. From the sharemarkets' point of view, this will be centred on the values and percentage payability of reef exposures. The results obtained are open to a fairly wide field of conjecture, although the indications are that they will in due course confirm the pattern established by drilling.

On the technical side, however, the adoption of new techniques and adaptations of existing ones may well provide some eye-openers in respect of rates of advance both on and off reef, as well as the surmounting of the difficulties peculiar to this new field.

The key to the optimum development rate is basically twofold—a high degree of mechanization and the application of the principle of teamwork to development crews.

So far as mechanization is concerned all the new mines are employing large numbers of mechanical loaders spilling into large self-tipping cars. The advantages of the mechanical loader was first demonstrated at Grootvlei and subsequently Marievale, when footages of more than 1,000 a month were established. In the case of the new mines, larger machines can be used since underground workings have been planned in advance to accommodate them.

Although not yet in use, an interesting development is the arrival in South Africa of loaders fitted with caterpillar tracks, which will render them more mobile compared with the existing types which operate on the ordinary car rails. These will probably necessitate some modification in the cross-section of development drives to allow of a clear throw from all angles, but the possibilities of this machine appear most interesting.

The maintenance of a team of both European and African workers throughout the duration of a specific task has been appreciated as a major factor in speed of operations for a considerable time past, and played a great part, for example, in the world record shaft-sinking work in the Free State. Apart from the time saved, work on a team basis reduces operating costs and enables the best use to be made of the available labour force, which is still one of the major problems confronting the whole mining industry.

An important development in organization of efficient teams is the aptitude tests now being applied to African recruits. Although no final conclusion has been reached of the degree of reliability of the tests, they are proving useful as a rough method of sorting out the labour force into groups most fitted for various types of work, including potential leaders.

The further step has now been taken of training teams on surface for work underground. The Freddies group in the Free State, for example, have dummy drives into the waste rock dumps, where teams are taught the handling of mechanical loaders. Conditions are identical with those which will be encountered underground, but with the important exception of operations being conducted in daylight.

Observers who have watched this type of training scheme are greatly impressed with its potentialities and are of the opinion that it will pay high dividends.

The only snag that arises at the present time is that the maximum success from teamwork can only be achieved by keeping the team together for as long as possible. At present, African workers usually only remain in employment for 270 shifts and then return to their homes. It is desirable, therefore, that they should be permitted to contract for a longer period of service, but it would appear that the policy of the present Government is opposed to any change from the traditional set-up.

A Week of Strikes

We are reminded this week that in addition to the many anxieties and hindrances to the potential production of raw materials of all kinds, and in particular the products of the mining industry, there is another influence, less generally stressed, and that is the attitude of labour now increasingly centred in a few great unions. This week we have to chronicle the strike of Mr. Lewis's 375,000 soft-coal miners in the United States; in Japan some 300,000 coal miners are reported to be on strike; and in Northern Rhodesia some 37,000 copper miners stopped work on Monday, thus closing down the copperbelt producers which last August turned out some 17,000 tons of blister copper, and 10,000 tons of electro besides 1,000 tons of cobalt alloy; the value of the whole for the month being some £6,000,000. Besides these major strikes the miners at Potresillos in Chile stopped work for two days after which their demand was conceded.

The reasons for these strikes differ as widely as the way of life of the communities concerned varies, but in the main the motive force is no doubt the desire of the mineworker for a bigger share in the profits of the respective industries. Some may suspect the long hand of Communist intrigue working on unsatisfied aspirations, as not altogether unconnected with this simultaneous stoppage in countries so dissimilar as the United States, Japan, Northern Rhodesia and Chile. We know so little of the degree of world Communist infiltration that to deny the possibility of such underground working is almost as difficult as to affirm its possible influence. Be this as it may, the problem of satisfying the mineworkers without hamstringing the economy of the operating companies is one which calls for the earnest consideration of all economic thinkers.

In the case of the United States, negotiations for a settlement of the present dispute are hardly likely to be seriously taken up until the issue of the presidential election is settled, the more so as it is reckoned that there are some ten weeks supply of coal already above ground. We have little or no knowledge of the commercial conditions in the Japanese coal mines but Communist influence is generally believed to be extensive in that area of Eastern Asia.

In Northern Rhodesia, the native miners will now have to meet a food shortage incidental to the stoppage of company rations, and were this factor to prove serious, the labour force might be disorganized and as much of it is not local, might return to tribal areas or seek work elsewhere, as for instance in the Congo Free State. The sudden visit of Mr. Prain and Mr. Marshall Clark to the field indicates that a serious view is taken of the situation.

Since 1940 it has become increasingly realized that no industrial country is self supporting in the matter of its metal and mineral deposits. Northern Rhodesia is the third largest copper producer in the world and were a strike of African miners prolonged and its labour organization disturbed, industry, especially in Great Britain, would be severely affected. The trouble is that until some method of satisfying labour appetite is devised the risk of serious international dislocation by major labour strikes must remain.

In South Africa, fortunately, the sudden growth of political and social tension does not so far appear to have affected the mining industry and particularly gold production. But unrest is contagious and its affect on native labour recruitment and on the contentment of the miner will be watched with some anxiety.

Canada

(From Our Own Correspondent)

Winnipeg, October 1

An ambitious scheme designed to pipe surplus gas from the petroleum areas of Alberta to the industrial centres of eastern Canada is under consideration. Both federal and provincial authorities are involved in discussions, and the outlook is that a favourable decision may be reached before the end of this year. The plan would entail laying a pipeline of some 3,000 miles in length—beginning at the foothills of the Rocky Mountains, running eastward across the prairies to Winnipeg, thence across Northern Ontario and Northern Quebec, to Montreal—and with one section branching southward to Toronto. In the minds of the planners—especially in the mind of Leslie Frost, Premier of Ontario, is the belief that oil and gas will also eventually be tapped in the James Bay area of Northern Ontario, in which case such an added source of supply would become tributary to the pipeline extending across northern Canada. A line capable of sending 100,000,000 cu. ft. of gas from west to east is the tentative capacity now under consideration.

As for the disposal of the increasing volume of petroleum coming from the Alberta oil fields, the pipeline built a year ago to the head of the Great Lakes at a cost of $100,000,000 is now operating at full capacity. At the same time, producers have turned their attention also toward the West. This week, the transport of oil by rail was commenced to the Pacific coast. This method of shipment is preliminary to the heavier flow which is to begin late next summer through the Trans-Mountain pipeline now in course of construction across the Rockies at an estimated cost of $82,000,000. This line will cover a distance of 800 miles from Edmonton in Alberta to Vancouver in British Columbia. The first 175 miles has been completed—and current progress is at an average rate of approximately three miles per day.

DECLINE IN GOLD PRODUCERS

Because of rising costs of operation, the number of gold producing mines in Canada has declined to 60. This compares with 140 producers just one decade ago. Unless costs decline or the price of the metal is raised, a further decrease in the number of producers is indicated. Meanwhile, the high esteem in which gold is held by governments was never greater than at the present time. These governments have made it unlawful for private individuals to buy gold at any price—yet at the same time refuse to pay more than $U.S.35 per oz. for the metal. Meanwhile, private holders are endeavouring to secure the metal by hook or by crook. Within the past few months, three major robberies have occurred involving the theft of gold. The latest occurred a few days ago when six bars of the yellow metal were whisked away mysteriously from a cage at the Malton airport, just outside Toronto—the six bars having a value of some $225,000 as based upon the standard price of $U.S.35 per oz., but recognized to have a much greater value on the black market. Where the gold is going on the black market is a mystery. Admittedly, the greater part of the gold output of the world is no longer finding its way to the national treasuries—but the question: whither the underground stream? has yet to be answered.

Sherritt-Gordon Mines in Northern Manitoba is moving steadily toward a stage of major production of nickel and copper from its Lynn Lake property. Railway construction to the mine is making good headway. Development of hydro-electric power is making rapid progress. Development of the mine is going steadily forward. Meanwhile, near Fort Saskatchewan, at a point about 18 miles northeast of Edmonton, the company has a large force of men employed in preparing the site for the construction of a $17,500,000 nickel-copper refinery. This refinery is designed to use Alberta gas for fuel and is to be completed in approximately two years.

DEVELOPMENT OF IRON DEPOSITS IN QUEBEC AND LABRADOR

Construction of the new 360-mile railway from Tidewater on the St. Lawrence to the heart of the iron ranges of Quebec and Labrador is proceeding at a fast pace. More than 3,000 men are employed on the terminal alone at Seven Islands on the north shore of the St. Lawrence River. A further 3,000 men are employed on the railway construction job, the development work at the mines themselves, and on the construction of two hydro-electric power plants. The ore so far indicated amounts to some 400,000,000 tons. More than three-score geologists have been employed. The initial programmes aim at an output of 35,000 tons of ore per day, or some 10,000,000 tons annually. Once geared to that initial rate, it will be possible to arrive at a better estimate of ore resources beyond the 400,000,000 tons so far disclosed. Having in mind the fact that the range of favourable formation extends over a length of 70 miles, and with only very small sections so far explored, it is believed by geologists that the tonnage so far estimated will be dwarfed by that still to be revealed. On such a basis of calculations the initial production rate of 10,000,000 tons annually will likewise be dwarfed by the rate of production reasonable to expect in the years to come.

IMPORTANCE OF NEW RAILWAY

A factor of untold significance in connection with the development of the new iron range is that it is bringing about the construction of a railway for a distance of 360 miles right into the heart of a virgin and heretofore unexplored territory. Small settlements are bound to become established at points along this transportation system, and from these bases, squads of prospectors are sure to fan out across the hills in all directions outside the iron formation—and it is considered probable that other mining areas will be discovered. There are known to be extensive areas in which the rock formations are favourable for the deposition of base metals such as copper, zinc and nickel, and, also, for gold and silver.

MANGANESE OR MAGNESIUM—IT'S ALL THE SAME!

Last week the usual standard of sub-editing in *The Mining Journal* slumped heavily. An article on manganese in our current Paley Report series appeared on page 429 under the bold and uncompromising heading of "Magnesium"! Our editorial face is red and our apology profound. Of the many and varied comments which we have received, alike from friend and foe, we liked best the following variation on an old theme addressed by a reader to one of our directors:

R. I. P.

Poor old Ursul, dead and gone,
We'll never see him more,
For what he thought was Epsom Salts
Was $MnSO_4$!

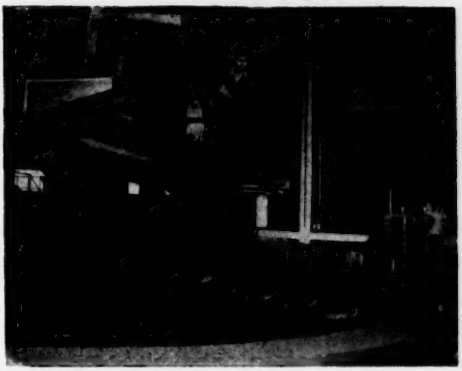
In point of fact, the section of the Paley Report dealing with magnesium had been previously discussed in *The Mining Journal* of October 3, page 370.

Cobalt Refining at Nkana, Northern Rhodesia

The industrial use of cobalt is a development of the last twenty years, and to-day its greater importance is based on the properties of its alloys. These have significant uses in industry, war and medicine, with the result that the metal has achieved an added importance in the modern world of industry. In the following article, which first appeared in *Rhokana Review*, Vol. 1, Nos. 11 and 12, a monthly magazine published by Rhokana Corporation Ltd., the varying stages of cobalt purification at Nkana are described, and a detailed explanation of the processes used at the company's new plant there are given.

The properties of cobalt resemble those of iron and nickel, and the metal occurs in many parts of the world in a variety of forms. The principal cobalt mining areas are the Congo-Rhodesian copper mineralized zone and French Morocco, with the world's largest producer being Union Minière.

The use of cobalt as a colouring agent in ceramics, the glassware and pigment industries, continues to account for a fair proportion of world production, and the metal has its uses in the indication of heat and moisture changes as well as in animal nutrition. Yet the importance of the modern and by far the greater consumption of the metal is based on the properties of its alloys. These properties have two distinct applications. Firstly, the improved mechanical strength imparted to alloys at elevated temperatures, and second, the permanent magnetism possible when cobalt is alloyed with iron and chromium, which is far superior to that of the best magnetic steel. Because of its high absorption capacity for neutrons, cobalt is used as a substitute for radium.



The feed control platform above the dry hearth of No. 3 roaster

INITIAL PRODUCTION

The first production of cobalt in the form of alloy was in 1933, and until the advent of the new plant this process was virtually unchanged. The method of cobalt recovery applied to the smelter circuit was to smelt the cobalt concentrates in a reverberatory furnace, the cobalt element tending to be concentrated in the matte or copper bearing molten sulphides. This matte, mixed with siliceous flux, was blown in the converters and the cobalt reported in the slag so generated; the slag after granulation and mixture with coke becoming the feed to the electric arc furnaces where the cobalt, accompanied by iron and copper, was reduced to the metallic state. It was then skimmed clean of slag and granulated in water. The alloy produced contained approximately 15 per cent copper, 40 per cent iron and 40 per cent cobalt. This was shipped to European refineries for the isolation of the cobalt element.

The recovery of the metal by this process was of a very low order and the production of an impure product entailed refining charges which increased the cost of the metal. Some previous work had been carried out on the production of a refined metal at better recovery, but it was not until 1948 that the basic metallurgical principles were established on which the present process is based. The new plant involves the processes of roasting, leaching, purification, electrolytic deposition and electric furnace refining.

The roasting section consists of six Herreschoff type, down draft, eight hearth roasters, each of which has its own storage bin and feed mechanism. The furnaces are lined with high grade firebrick and the centre column and rabble arms are air-cooled, the hot air produced by this cooling being used for roasting.

ROASTING PROCESS

The concentrates are fed to the top of the roasters at the rate of approximately 40 tons per day, on the top or external hearth some drying is obtained, the concentrates enter the roaster into the first hearth through a Bell Hopper mechanism controlled to give a seal at all times other than when it is feeding. Drying is completed on the first hearths and as the concentrate travels inwards and outwards down the roaster, the sulphur contained in the concentrates burns in the hot air supplied to sulphur dioxide and the oxides of copper, iron and cobalt are formed. This sulphur dioxide later reacts with oxygen from the air to form sulphur trioxide which in the lower levels again reacts with the metallic oxides to form the respective sulphates.

Fuel oil is burnt in the seventh and eighth hearths to decompose some of the copper sulphate and render it insoluble in water. This requires very careful control, otherwise with too high a temperature the cobalt sulphate commences to decompose and cannot be recovered. The calcine so produced drops from the roasters into water-cooled spiral conveyors and is carried forward to the leaching section.

The gases leave the roasters through ducts at the bottom and are taken to the economizer where steam is generated and the gases cooled. They then proceed to the electrostatic precipitator where all dust is removed prior to ejection to the atmosphere. The scrubbing of this gas will involve an expensive installation, but is being actively pursued. The steam so generated is used for process heating later in the circuit.

The calcines are stored in four 100-ton storage bins from which they are removed, weighed and leached in hot water; here all the cobalt sulphate and some of the copper sulphate is dissolved, the control of the amount of copper passing into solution being a function of contact time and temperature. From the leach tanks the pulp flows to stainless steel filters where the copper bearing residue is separated from the solution containing the cobalt sulphate and some impurities. This residue is sent to the smelter for copper recovery. The solution or filtrate is pumped to the purification circuits.

In the first circuit of four tanks, milk of lime is added and under conditions of aeration all the iron and some of the copper is precipitated, this precipitate being separated in a 40 ft. thickener. The burgundy-coloured overflow from this thickener is pumped to the cementation cascades where

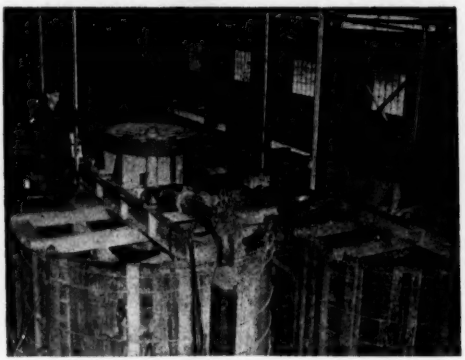
the last traces of copper are removed in contact with pure metallic cobalt. The underflow from this 40 ft. thickener, mixed with various other plant residues is treated in a small separate circuit with sulphuric acid, and milk of lime which dissolves any entrained cobalt. This acid leached residue is mixed with the original leach pulp at the primary filters so that all copper passes to the smelter for copper recovery.

The cobalt contained in the purified solution is next precipitated in two tanks using more milk of lime and this pale green precipitate is separated from the waste water in another 40 ft. thickener, the underflow of which is pumped to another set of filters where the cobalt bearing cake is dissolved in acid generated in the electrolyte by the process of electrolysis.

ELECTROLYSIS IN CONTROLLED FLOW

The pale green cobalt hydroxide precipitate is filtered on another set of stainless steel drum filters, the filtrate of which is waste water. The filter cake is mixed with spent electrolyte and acid and passes into solution in a cascade of four mechanically agitated tanks, the overflow of which passes to another 50 ft. thickener where the solution is clarified and insoluble calcium sulphate settles to the bottom.

The overflow from this thickener is pumped to electrolyte storage from where it is drawn off as required and passes through stainless steel heat exchangers which raise the temperature of the solution up to 60° C. Electrolysis is carried out in sixty-four lead lined cells, the flow through these cells being controlled from two steady head tanks, each of which serves thirty-two cells. Each cell contains twelve mild steel cathodes and thirteen lead anodes. Power is supplied to the cells by two motor generator sets of 360 kW. capacity, each cell having an applied voltage of four volts at a current density of 15 amperes per sq. ft.



No. 1 purification tank. In the background are pH meters on the neutralization circuit

The cobalt is plated out of solution and after eight days a deposit of 3/16 in. to ¼ in. thick is obtained. The cathode is then removed, thoroughly washed and the metal stripped from the mild steel blank and after weighing and sampling it is transported to the electric furnaces for final refining. The spent electrolyte or solution from electrolysis is now acid and is pumped to the four mechanically agitated tanks where the cobalt content is regenerated and the acid neutralized by the addition of more pale green hydroxide.

ELECTRIC FURNACE REFINING

The electric furnace refining is carried out in three-ton furnaces lined with magnesite brick and supplied with three-phase current at 120 volts and 2,000 amps per phase. The furnace is charged with cathode metal, the power switched on, and after approximately two hours the bath will be molten and at a temperature of 1,700° C. The primary operation is the formation of a carbide slag with calcium carbide and lime for the removal of sulphur which originates as entrained sulphates from the electrolyte. The process of sulphur removal is observed by examination of the surface of a series of test buttons, the completion of the reaction being indicated by a flat set.

The carbide slag is then skimmed clear of the molten metal and decarbonizing with jets of oxygen commences, a hollow ridged set indicates complete carbon removal and the presence of excess oxygen which is eliminated from the metal by the addition of aluminium and calcium silicide, the sample button set now being slightly convex. Lime is next added to the top of the bath and the power is switched on to raise the temperature of the metal prior to granulation.

The refined metal, when up to the required temperature, is granulated in a car in which the water has a rapid rate of circulation, the aim being to produce solid granules with a minimum of minus ¼ in. material and little over 1 in. size. The solid metal is transferred to the burnishing plant where it is dried in a rotary oil fired drier, the dry metal is then polished in rotating wood lined drums containing sawdust. The silvery, polished metal is screened into various sizes and then packed into 500 lb. steel drums for shipment.

In the near future a further product of the new plant will be cobalt carbonate. This new process will receive pure cobalt bearing solution from the cementation cascades, to which a strong solution of soda ash (commercial sodium carbonate) is added in mechanically agitated, steam-heated tanks. The blue precipitate (cobalt carbonate) is filtered in a pressure filter and the filter cake consisting of cobalt carbonate is dried and crushed prior to shipment to England for the preparation of various cobalt oxides used in the ceramic industries.

At present the plant only treats 40 per cent of the cobalt contained in the ore as mined because the remainder is lost either in the concentrator tailings or in the smelter slag dump. This is because the concentrator produces two concentrates; the first of which, although it is primarily a copper concentrate, contains a fairly high proportion of the cobalt in the ore.

IMPORTANCE OF IMPROVED RECOVERY

This cobalt is not recovered in the smelter but passes through to the slag with the result that the smelter slag dump, which is estimated at approximately 2,000,000 tons, contains one per cent of cobalt and might provide a possible source of cobalt in the future. Experimental work is always being carried out to improve the recovery of cobalt from cobalt concentrates for treatment at the new cobalt plant. A slight improvement in this recovery would result in a corresponding improvement in the recovery from ore to metal. The smelter slag dump containing 2,000,000 tons of slag assaying over 1 per cent cobalt is a future source of metal which is a major metallurgical problem of its own.

The importance of Northern Rhodesia as a producer of copper within the sterling area is well known, the production of refined cobalt metal is a step towards widening the basic economy of the Colony.

Management Training for Mining Engineers

Earlier this month, Mr. J. B. Richardson, lecturer in Mining at the Royal School of Mines, presented a paper before the Institution of Mining and Metallurgy in London dealing with "The Status, Training and Vocation of Graduates in Metal Mining." This paper surveyed the whole problem of higher technical education as applied to the metalliferous mining engineer, including the problems of intake from secondary schools, congestion of the university syllabus, recruitment to the technical branches of the scholastic profession and management training for the mining engineer. Of these many sided aspects of an important subject the excerpts which follow deal only with the last-named problem, that of how and when to provide the mining engineer with management training. It is a matter which we regard as being of major importance for the industry, and elsewhere in this issue under "Notes and Comments" we have taken the opportunity, provided by the recent I.M.M. meeting, to consider this matter at some length.

A mining engineer to succeed in management must know enough of mining technology to understand the process he controls, have enough commercial knowledge to understand the importance of efficiency, reduction of costs, and organization, as well as taxation and obsolescence, and know enough of human relationships to understand the men whose work he is guiding. He can be taught the principles of all three during his graduate course if the syllabus will allow the time to be spent.

THE TEACHING OF BUSINESS METHODS

The first of these requisites is in most cases adequately covered in the courses taken for a mining degree or diploma. Equally important for the man who aspires to a high executive position is to possess the capacity to organize and grasp the economic advantages of different methods of working. He must be able to turn his considered technical opinion into £.s.d.—often a difficult task, with so many variables, for an experienced, conscientious engineer without cloaking statements in reservations and conditions that render them unintelligible to the layman; hence the importance of teaching business methods. Early varied experience gives a wider outlook in such matters. The applied scientist must also have wide knowledge and good personal qualities for in the art of directing the resources of nature to the use of man, skill in human relationships is as important as technical ability, but the quality that fits men for human relationships is not quite the same as the "humanities" of the educationist. It is significant that in the short full-time National Coal Board residential courses of directed practical training of mining engineers and colliery managers ten out of fifteen lecture-discussions deal with one phase or another of human relationships.

There is another school of thought in regard to this matter for, in the opinion of many, management cannot be taught but only slowly acquired, and these critics say mining cannot be learnt in a classroom. But neither can mine-management be taught in a stope. The economics of a mine and the handling of its labour, safety included, are management responsibilities. Methods of working, machinery, ventilation, and surveying have become specialist tasks. To-day a good manager is trained, not born.

THE BEGINNINGS OF SPECIALIZATION

In British mines at home and abroad technical management right up to a century ago was in the hands of practical men raised from the ranks of the working miners. Self-educated, and competent to control the small mines of their day, some of them accumulated a wealth of local geological and technical knowledge. However, as the number of mines abroad multiplied the technical needs were supplied by a growing body of free-lance consulting mining engineers, some trained and qualified in this comparatively new profession, others civil or mechanical engineers practising mining, and some not trained at all. While some tackled all the activities of the concerns they guided, others devoted their attention to the treatment of ores and others to ore-finding and geological problems.

Up to a variable period in the beginning of this century, depending upon the degree of mechanization at the particular mine or mining district, men graduated in mining dealt with miners who were still skilled craftsmen and who could be left alone to do their work, just as a skilled joiner can to-day. The new graduate then filled the post of surveyor or assayer, knowledge outside the ken of the practical foreman; in due course, having served his apprenticeship, he gained seniority as mine captain, underground manager, and, later, general manager, often without ever physically undertaking for pay the tasks of drilling, timbering, or shaft sinking. Moreover, the graduate was usually drawn from a different social stratum then. Nevertheless, throughout this period both the old-style mine captain and the younger breed of qualified mining engineer worked side by side in new mining districts, teaching natives of many lands how to use the newly-developed compressed-air machines, explosives, and ore-dressing machinery, as well as imparting to them the art of mining.

THE EMERGENCE OF THE PROFESSIONAL

Slowly, with the growth of technology and increase in size of mining units, the management of mines passed from the old mine "captains" to men trained as professionals with a knowledge of the basic sciences, a university degree, or an equivalent diploma. Right up to World War I the majority of mine managers were their own geologists and mineral dressers but, as the mines became deeper, more mechanized and larger, engineers became more specialized. Mining geology became a distinct profession and mineral dressing a special branch of mining engineering. The larger companies or groups of companies became able to afford their own full-time consultants with the gradual elimination of the individual independent consultant. The late William Cullen said even before the war "A few eke out a precarious living, but the end is near."

As mechanization spread rapidly all over the world it soon became apparent in countries where highly-paid white miners were employed that the mining graduate must not only learn theory, but also be able to use machines to the best advantage and teach others how to do so. Thus the road to promotion became a different one, passing through the hierarchy of executive officials (and later through the study or efficiency department as well) and no longer through the survey or assay office. It is rarely to-day that the ladder of promotion is not through the executive branch. In a recent publication of the Transvaal Chamber of Mines it is indeed declared to be so.

Naturally and for a long time the ranks of junior underground officials have been filled by promotion from the ranks of miners, and up to shift boss or mine captain it is in most cases still the rule, but in some mining districts to-day such men must pass examinations and gain a theoretical knowledge of their work if they wish to reach higher executive rank. General managers and underground managers are usually but not always graduates of mining

schools and the majority have climbed the ladder of promotion from junior supervisory grades.

TEACHING OF THE HUMANITIES

Over a quarter of a century ago the industry begged the mining schools to teach more mechanics to their students, because of the rapidly increasing mechanization of mining process; that is now done. To-day the plea is for the humanities, but it should also be for commercial principles. Is it not possible that academic teaching lags behind the industry's requirements in this country? After all, no live industry is static. R. W. Diamond pointed out to a graduating class at Queen's University, Toronto, two years ago that character, ideals, personality, imagination, initiative, sense of humour, enthusiasm, and ability are as important as technical knowledge. Men trained in applied science are builders; first principles are merely a good foundation.

While it is right that the mining graduate should know the principles of everything that he will have to tackle in his professional life, it is absurd that contesting teachers, in a brief four years, should try to make him expert in all technical branches of the profession to the neglect of the most important aspects of management, commercial practice, and human relationships which will occupy more and more of his working life as he climbs up the executive ladder to general managership. The idea is out of date that the principles of commercial management and human relationships must be picked up during his working life and cannot be taught just as well as the principles of mining. They can, and candidates entering other industries are so instructed, a point made clear by F. G. Hill in his presidential address to the Chemical, Metallurgical, and Mining Society of South Africa.

THE EXAMPLE OF THE U.S.A.

In the United States it is customary for thousands of industrial executives, including middle-aged men from American and Canadian mining circles, to attend an elaborate system of post-graduate courses and throughout their careers to return to academic life for short or long periods. The specialist team that visited the U.S.A. in the Spring of 1951, under the leadership of Col. Urwick, to study "Education for Management" reported at the Sixth Annual Conference of the British Institute of Management of November, 1951, that the average age of those attending the Advanced Management Programme of the Harvard Graduate School of Business Administration was 43 years and that their salaries ranged from $15,000 to $20,000 a year. There was the closest liaison between universities and industry; professors were actively engaged as business consultants and senior directors held university appointments as special lecturers. The suggestion of one member in a recent discussion that mining graduates come back, after attaining, say, mine captain status, for a postgraduate course in commercial and managerial subjects—if not at their old university then at some such institution as the Administration Staff College at Henley—is excellent, but only if they are subsidized by the employing company, because it is improbable that men after five or ten years would return from abroad to take such courses at their own expense, partly because of the interruption to their advance in the profession and because they have normally acquired domestic responsibilities in the meantime. It is surely better to instil a sound knowledge of commercial methods and practices during their receptive studenthood, if only to whet their appetites and thus give them a chance to appreciate the importance of such knowledge when they go into the field, than to leave them to pick it up haphazard.

Current American opinion is that a significant and distinctive characteristic of engineering curricula is teaching to design, so that an engineer is distinguished by his ability to design and develop. The inference is that the mining engineer is going to design, construct, and operate, whereas a geologist is not, although both are interested in the nature and formation of the earth's crust. An engineer's curriculum there could be divided into five parts: basic science, applied science, applied engineering, administrative and managerial studies, and courses with a general educational (cultural) background. A. F. Taggart makes the interesting suggestion that education for engineers should consist of human relations, basic science, basic engineering, and speciality subjects—the basic subjects including properties of solids, properties of fluids, static structures, machine elements, industrial energy transformations, and instrumentation.

The difficulties presented to Boards of Studies are obvious, but, with the syllabuses under constant review, opportunities must present themselves of studying the curriculum against the requirements of the industry, unless, of course, the attitude is taken that the task is to produce first-class scientists rather than future leaders of the industry.

QUALITIES SOUGHT BY INDUSTRY

What does industry generally really want from graduates in technological subjects?—apparently highly skilled technologists who are suitable candidates for higher posts in management, and with the moral integrity that must run parallel with intellectual achievement in all professional men. The Federation of British Industries asked their Industrial Research and Education Committee to consider the relationship between industry and the universities. In an interim report the replies from 40 out of 43 large concerns pointed out that it was open to graduates to reach the highest posts, but only exceptional people could fill them. It was stated that graduates needed training varying from six months to three years, and that they must be more co-operative. They found few of the leader type, too many expecting high salaries before showing justification of the responsibility of such posts, and many with inability to express themselves. Another source reports that students were well and adequately prepared in the technology required, but less satisfactory in their knowledge of economics. It compares British graduates with American from that standpoint and finds in the latter the instinctive appreciation of the economics of industry that ours lack. If, as recently stressed by an English engineer writing on American industry, the typical American graduate takes to the business side of mining as a duck to water, is it a national trait, or is there something lacking in the make-up or education of his British counterpart?

According to the Survey of European Coal Problems (issued by the research and planning division of the United Nations Economic Commission in Europe on February 24, 1952) the British coal industry is handicapped by the shortage of capable men at higher managerial levels, both technical and administrative; this managerial bottleneck may be more serious than the more highly publicized shortage of manual labour. Does this not support the plea that a certain amount of time in the curricula should be devoted to the science of management? If the senior administrative posts can be held by a technical man, an expensive item in the salary list is saved. Industry has itself to blame if it does not apply more science and less guesswork in taking on graduate workers. In our circles London offices might do a lot more to weed out types unlikely to give satisfaction and thus reduce excessive staff turnover

Correspondence

STRAND ROPES

To the Editor, *The Mining Journal*.

Sir,—The article on ropes in your issue of September 5 was interesting but there are several points which need correction.

(1) Seale construction would never be made with strands of 6 outer wires, and even 7 outer wires would rarely, if ever, be made. The "two layered 'Seale'" is mostly confined to 8, 9 and 10 outers, the 9 being most favoured.

(2). The reference to "Modified" Seale is unfortunate for this is one of the American trade terms which may cover *any* Equal Laid rope except a true Seale but not defining which, for there are others. The article in describing the 12 outers equal laid is referring to the Filler Wire construction, British Standard nomenclature "6 x 19 plus 6 filler wires." There is yet another Equal Laid build up, *i.e.*, Warrington, which has large and smaller wires on the outer layer. The large wire seating in the gusset formed by two of the inner wires and the smaller wire lying in the crown of an under wire.

(3). The reference to the Factories Act, stipulating a margin of safety of 6-1 is not correct. The only reference in the Factories Act and its Kindred Regulations to a Factor of Safety is that contained in the Docks Regulations 1934 and in the Schedule thereof:

"(e) In the case of Wire Ropes a sample shall be tested to destruction and the Safe Working Load shall not exceed 1/5th of the Breaking Load of the sample tested."

True it is that the usual Factor of Safety for ropes other than those used on lifts and those under Docks Regulations—is 6-1 which was agreed by the Ministry of Labour & National Service and the Federation of Wire Rope Makers as a reasonable basis for operating the Act Regulations.

(4). Finally, I deplore the use of the term "Modulus of Elasticity" being applied to wire ropes. Young's Modulus is on the assumption "if the material were perfectly elastic" and with rare exceptions wire ropes are far from being perfectly elastic. The exceptions are, colliery winding ropes, suspension bridge ropes and those similarly employed where the ropes are constantly under a load of some magnitude.

26, Avenue Road, A. B. WATTS.
Doncaster. September 17, 1952.

To the Editor, *The Mining Journal*.

Sir,—In reply to Mr. A. B. Watts' communication relative to the article "Strand Ropes: Winding, Haulage and Crane," published in the September 5 issue of *The Mining Journal*, I submit the following for your consideration:

(1) In dealing with Mr. Watts' first comment I cannot do better than quote the late Mr. H. K. L. Lloyd, A.M.Inst.C.E., whom Mr. Watts, I'm sure, will agree was one of the leading authorities in this country on wire ropes and production. Writing in the *Mechanical World* of September 29, 1933, Mr. Lloyd said (page 936):

"In Group I, for small diameters, the simple construction of 6 strands each of 7 wires (6 over 1) is in general use, but for ropes of appreciably over 1 in. in diameter it is strongly recommended that the old construction of 7 or more outer wires over a 7 wire core be discontinued as producing internal cross-cutting between the layers of wires and that the Seale construction be adopted in all cases of more than 6 outer wires.

"In the Seale construction the strands have two layers of wires round a centre, the outer and inner layers consist of the same number of wires; the outer wires lie in the grooves between the inner ones, all being laid up at the one operation. They are consequently in line contact throughout, and there is no internal cross-cutting."

(2). With regard to the term "Modified Seale," it is admitted the term "modified" is a U.S.A. trade term, but it has been used in this country for a number of years. To again quote Mr. Lloyd: "Seale construction would involve the use of very small wires for the inner layer, and what is called Modified Seale is usually adopted, *ie.*, 6 inner wires of the same diameter as the 12 outers, and with 6 filler wires all laid up at the one operation in line contact with the same length of lay to avoid cross-cutting internally."

(3). With regard to the Factories Act and Safety Factor, I admit that my original reference was incorrectly stated.

(4). With regard to modulus of elasticity—the information relative to what value to give the modulus of elasticity and the investigations by Prof. Hrabak was furnished by the late Mr. Lloyd in a paper read before the Liverpool Engineering Society on March 1, 1939. The exceptions made by Mr. Watts are noted, and in the case of colliery winding ropes may I point out the sub-title of the article is "Winding, Haulage and Crane."

Trusting the foregoing meet Mr. Watts' criticism of the article.

43, White Lane, RICHARD SAXTON,
Gleadless, Sheffield. October 6, 1952.

[*The first point of criticism in Mr. Watts' letter appears to have arisen from faulty paragraphing in the original article. If the sentence "Endurance tests demonstrate the remarkable improvement in service this construction furnishes," which is at the beginning of the third paragraph in Mr. Saxton's article, had been printed as the last sentence of the second pararaph the point would have been clearer. In fact the author does not state that six outer wires are used in Seale construction. He says "Construction is usually up to one inch diameter, six strands each, six wires over one," the implication being that this is the construction of a simple six-stranded rope.*

The second point in Mr. Watts' letter is tenable, but the term "modified Seale" was used in the authoritative English paper referred to by Mr. Saxton. Pressure of space no doubt prevented the author from dealing with the Warrington construction so well described by Mr. Watts.

We feel there is no substance in Mr. Watts' last point having regard to the fact that the term "modulus of elasticity" has been used in technical papers for many years to describe the ratio between the average tensile stress in the wires and the resulting strain of the rope subjected to loads within the elastic limit.—Ed., *M.J.*]

Machinery for China

Within the limits of the International Economic Conference held in Moscow last April it is apparent that there is scope for a considerable volume of trade between the U.K. and Communist China. Already orders for about £4,000,000 of industrial equipment have been received by British firms, although this apparently is only a beginning. In return, China is shipping to Britain items such as tung oil, bristles, soya beans and eggs.

Recently the China National Import-Export Corporation has declared that it is prepared to place orders in Britain for £10,000,000 worth of machinery and equipment. The London Export Corporation who are acting as U.K. Agents of the China National Import-Export Corporation is inviting enquiries from British firms interested in this market. On page 447 we publish this week an announcement by the London Export Corporation specifying the particular categories of goods which China is seeking to obtain in this country. Several of these should be of direct interest to those supplying equipment to the heavy industries not least to mining.

There seems little doubt that there will be considerable competition for this market, particularly from Germany and Japan. Nevertheless, British manufacturers start with the advantage that traditionally China has always obtained from this country a substantial proportion of her industrial equipment and Chinese engineers have been brought up with British machines.

All contracts with China are of course subject to Board of Trade Export regulations, and in the granting of licences the strategic importance of the goods involved must clearly be taken into account.

TECHNICAL BRIEFS

A New American Metal Coating Process

The Linde Air Products Co. of the Union Carbide and Carbon Corporation of New York, have announced the development of a new process to apply tungsten carbide and other metallic powders to metal parts. The new process is called "flame plating," and it is claimed that its action will not warp or soften the treated parts as the processing is carried out at relatively low temperatures.

The process, which can be applied to cast iron, bronze, titanium, magnesium and steel, is also said to give a permanent surface that will not chip or peel. The coating is applied without raising temperature more than a few hundred degrees centigrade, and previously tungsten carbide could not be deposited on metal products because the high temperatures required would distort or change the metallurgical properties of the base metal.

One distinct advantage of the process, apart from its application of protective coatings at low temperatures, is that flat areas, cylinders, holes and parts of various shapes and contours may be coated with thicknesses ranging from 0.0005 in. to 0.02 in. Surfaces up to 6 in. wide and 40 in. long can be handled, the plated section can be used as coated or ground to a mirror-like finish, and the coating is not diluted in any way.

In most applications of the process, parts flame-plated with tungsten-carbide have shown wear resistance equal or superior to sintered tungsten carbides and superior also to cast-alloys, hard chrome plating and tool steels. Parts flame-plated with tungsten-carbide are claimed to have all the desirable properties of sintered tungsten-carbide, that is, resistance to abrasion and frictional wear, and in addition have lower elasticity and improved resistance to impact and therm shock.

As the temperature of the base metal does not exceed 400° F. during the plating operation, a possibility of change in the properties of the metal being plated are eliminated and chance of warping is minimized. Industrial applications of the process include use on metal parts that require protection from severe abrasion and frictional wear, and as protection for precision parts.

Ductile Iron Demonstration

A cast iron that bends has been demonstrated at the Bayonne Research Laboratory of the International Nickel Co. The metal is known as "ductile iron" and has been developed by the company after many years of research.

The demonstration showed the production, properties and application of ductile iron, a new engineering material which bridges the gap between ordinary grey iron and cast steel. Reports state that the outstanding strength of the metal, its ductility and exceptional resistance to shock, are of exceptional use throughout the industrial world and are proving the factors which lead to ductile iron being found "the end goal of a search foundrymen have been making for generations."

Ductile iron is a high carbon ferrous product with graphite in the form of spheroids resulting from a special content of magnesium. Grey cast iron is relatively weak and brittle because its graphite is flaked and these flakes form a multitude of notches and discontinuities in the metallic matrix. Compacting the graphite in the form of spheroids minimizes internal notching and greatly increases the proportion of effective matrix structure.

It is reported that an example of one of the best uses of ductile iron is for the production of complex shapes to high mechanical properties. Many modern machinery parts are too intricate to be cast in steel and have inadequate mechanical properties when cast in grey iron.

The company announce that approximately 200 firms in the United States, Canada and other countries, operating a conservative estimate of 500 foundries, have been licensed to produce ductile iron. Among the uses to which the metal has been applied since it was first put on the market three years ago are the manufacture of jet engine and gun parts, tractors and gears from paper machines, glass machinery castings and door control parts.

Production in 1952 is expected to double that of 1951, and an annual production figure of between 2,000,000 and 5,000,000 tons is anticipated.

New Alloy Allows for Larger Steam Turbine Generators

After eight years of research, a new alloy composed of aluminium with very small quantities of iron, magnesium and silicon, has enabled the General Electric Co., America, to commence the manufacture of steam turbine generators 35 per cent more powerful than any of the type previously made. The new alloy is named "Cond-al," and its light weight, high conductivity, and resistance to the various stresses imposed by operations at high speeds and temperatures, are said to be properties which remove a previous limitation on the size of turbine generators.

Manufacture of the first four units to utilize the new alloy is proceeding, and the first is expected to be completed before the end of the year. Each of these units is rated at 216,000 kva, and will operate at 3,600 r.p.m. At the moment, what is reported as the largest and most powerful turbine generator of this type is a 160,000 kva machine, also a General Electric construction.

The new 216,000 kva units will each weigh more than 700 tons and will be nearly 82 ft. long 17 ft. wide, and will stand more than 10 ft. above floor level. A method of double frame construction has been developed for this new type.

Close Specific Gravity Separation with the Cyclone

The results of some experimental work on the separation of fine size, close specific gravity solids in the liquid-solid cyclone have recently been given by J. J. Moder and D. A. Dahlstrom (*Chem. Eng. Progr.*, 1952, 48, 75). A 3 in. diameter, 15 in. long cyclone was used in which various adjustments could be made, for example the volume of underflow and overflow could be altered by varying outlet pipe sizes. Separation was found to be most efficient in dilute slurries having a concentration of less than 3 per cent and the degree of separation increased steadily with the pressure head. This latter increase however was asymptotic in nature approaching the maximum value as the head exceeded 100 ft.

The authors do, in fact, recommend a head of 40 ft. and a multi-stage separation. The separation efficiency was found to be independent of the actual inlet nozzle velocities, but it did fall off steadily as more liquid passed to the underflow taking part of the floats with it. It was found that almost complete separation could be obtained for two solids having a specific gravity ratio 1.0:1.1 and an 80 per cent separation for a ratio 1.0:1.02.

The Elimination of Industrial Plant Smoke

A new device for the smokeless burning of petroleum fumes has been demonstrated in America by the Esso Standard Oil Co. The device is based on a safety flare which is used to reduce pressure on refinery equipment during any interruptions in production. In an operating emergency the fumes, instead of building up pressure in equipment, are forced through the safety flare where the highly inflammable gases are burnt up. This new type of safety flare allows the introduction of gas and water spray, and permits its combustion and final flaring in gradual stages.

The device itself consists of three concentric masonry stacks, the largest of which is 30 ft. high and 14 ft. in diameter. Gas and water are combined in the small innermost stack, and as they emerge two pilot lights ignite the mixture for initial combustion in the second stack. The third and outer stack affords a larger and better draught for the final flaring of the mixture. Thus the operation is confined within the safety flare itself.

A Lead-Steel-Copper Combination

A process of uniting lead with steel and copper is being developed at Knapp Mills, in America. The process is claimed to produce a combination metal having the resistance of lead to corrosion by acids and alkalis, coupled with the strength of steel and the conductivity of copper.

It is reported that one of the uses of the metal is for anodizing aluminium to produce a surface as hard as sapphire. Another use is to provide electrolytes for a chrome-plating process yielding a uniform and extremely hard chrome surface now reported as being used in plane and Diesel engines.

METALS, MINERALS AND ALLOYS

From a statement issued by Mr. Henry Fowler, the U.S. Defence Mobilizer, it appears as though the pressure on a number of metals will continue. He referred to these metals as "Band 1," interpreted as nickel, tungsten, cobalt, columbium, tantalum and beryl. The Government is so anxious to increase the production of these "Band 1" materials, that it is prepared to consider loans and advances to producers, grants of funds for exploration, market guarantees, premium prices and bonus payments to expand supplies. If these or similar measures fail to stimulate production, D.M.P.A. would consider increasing production facilities, though specific authority from Congress would be necessary.

The U.S. allocation of copper and aluminium for the first quarter of 1953 has disappointed manufacturers, as the quotas are to be left unchanged, viz., 50 per cent and 55 per cent respectively of the pre-Korean deliveries. Smaller deliveries of copper scrap have helped to keep the copper allocation at the previous level, while the drought in the Pacific North West and in the Tennessee Valley has severely reduced the actual output of aluminium, thereby nullifying the increased production in other areas.

COPPER.—Copper production this week has been reduced by two strikes, a smaller and a greater. The smaller strike, which lasted for only two days, was at the Potrerillos copper plant, owned by Anaconda, and it was settled by the intervention of the Chilean Government. Incidentally, Anaconda has been losing a certain amount of copper by the continued go-slow tactics at Chuquicamata. The larger strike was, of course, in the Northern Rhodesian copper belt, resulting in a definite shut down of the four producers. Further reference to this occurs on page 453.

The future price of copper is a subject of constant discussion; one indication that the steam is going out of the market is the greater difficulty now being experienced in selling copper products overseas. The Rhodesian copper strike will defer the day when the copper price will be really tested, but the impending U.S. presidential election may be bringing the testing time nearer. An Australian mine, the New Occidental Gold Mines of Cobar, has been forced out of production before there has been any break in the price. The mine, which is the third largest producer in Australia, is shutting down because of high working costs.

LEAD.—In New York producers have complained that stocks held by the British Government have been unloaded in large quantities outside market hours. Certainly this would appear contrary to the undertaking given before the lead market reopened, and in London the belief is held that the Government has been acting within the spirit of that obligation. Meanwhile, with the price of lead drifting lower and consumers following a policy of living from hand-to-mouth, there are no signs yet of increased consumption.

The Economic Ministry of Western Germany has hitherto based its lead quotation in a list of non-ferrous metal prices on the New York market but according to a Reuter report, it is now considering following the London fluctuations. Ordinary scrap is now quoted around £73 per ton in London.

TIN.—Both the recent strength and the present weakness of the price of tin are attributed to deals in the metal which have used cheap sterling. The technique, quite simply, was to obtain "transferable" sterling which has been standing at a substantial discount with the official dollar-sterling parity and with it to buy tin. This was then shipped to a Continental port and re-shipped to the U.S. where it was sold for dollars. The merchant might have been content with acquiring dollars in this way, or he might have gone a stage farther and converted his dollars into sterling at the official rate. In this case his profit would have consisted in the difference between the amount of sterling with which he commenced operations and the receipts from his dollar conversion. There would have been some expenses, but after allowing for them, the profit was attractive enough.

The Bank of England has tried to stop these deals by requiring from metal brokers a form of guarantee covering the destination of the metal. This action has removed the cause of the recent rise in the price of tin to the year's high and the price has dropped to £952. It has been argued that as the Bank allowed commodity switching because of the U.K.'s deficit with E.P.U., it should allow these deals to continue. But the earlier switching was allowed by our authorities because they brought this country some profits without further strain on foreign exchange. The arrangement, now banned, has caused us to lose dollars or to put profits in the pockets of our competitors. Until full freedom is restored, it is difficult to see what other course the Bank can take.

ZINC.—Viscount Swinton announced in the House of Lords yesterday that the Government has decided to restore zinc to private trading as soon as the necessary arrangements can be made. It is hoped dealings on the Metal Exchange can be resumed by Jan. 1. On the Continent zinc is realizing no more than £90 to £95 a ton and foreign offerings in the States are being made at well below the New York market price. The U.S. zinc price finally weakened yesterday under this pressure and as we go to press a split price is operating at 12½c.-13½c. Even so, buyers are reported to be still holding off.

ALUMINIUM.—Four changes in the official price of aluminium have already been made this year: in January the price was raised from £124 to £148 per l.ton and changes in April and July brought the price up to £157 per ton. In announcing this week that the price was to be raised again, this time to £166 per ton d/d., the Ministry specifically stated that it expects to be able to keep the price at this level at least until April, 1953. This statement was doubtless intended to give confidence in a period of price stability, but as part of the present change was due to the appreciation of the Canadian dollar, an event which has been partly responsible for earlier changes; the forecast will be accepted with some degree of caution.

COLUMBITE.—So great is the demand for columbite that proposals have been made to ship part of the slag heaps at the tin smelters in Penang and Singapore for treatment in the U.S. These heaps, which have been accumulating for a long period, have recently been tested by American metallurgists who appear hopeful of being able to recover large quantities of columbite. Reliable analysis of these slag dumps has been found difficult in the Straits.

QUICKSILVER.—Reuter reports from Bombay a sharp increase in the price of quicksilver since the recent announcement that the Indian Government was to allow the export of 10,000 flasks of 76 lb. each. The sterling equivalent of the Indian price was recently around £30, and a further rise is expected. With the export duty of £22 10s. on top of this the trade is talking Indian quicksilver up to around £58 f.o.b. Indian stocks are at present estimated at some 23,000 flasks against an annual industrial consumption of about 5,000 flasks.

TITANIUM.—According to the *E. & M.J.*, the Japanese are reported to be claiming a method of producing titanium more efficient than the Kroll method. Vapours of magnesium and titanium are subjected to a high frequency electric charge in the presence of a catalyzer. The titanium is precipitated in granular, and not powder form. The cost of this method of production is stated to be one-half that of the Kroll process.

TUNGSTEN.—The Ministry of Materials has widened the gap between its buying and selling prices by reducing the buying price of wolfram ore to 410s. per l.ton unit c.i.f. from 425s. The official selling price has not been affected at 447s. 6d. The buying price of scheelite has also been reduced from 425s. per unit for minimum 65 per cent material; the new price in this instance is 400s. There appears to be quite a substantial amount of material on offer and the Ministry of Supply think they can cover their requirements at the new price.

The London Metal Market

(From Our Metal Exchange Correspondent)

The London tin market has been somewhat subdued since members of the Exchange were warned last Friday evening that the Bank of England had stated that there has been an alarming increase in the amount of tin being on-shipped to America against payment in transferable sterling. These sales are considered most undesirable, and members were informed that they must be stopped, and that sales should not be made if the least suspicion existed that the metal might find its way to America via the Continental or Middle East purchasers, including scheduled territories in the East, unless payment in dollars is assured. As a result the market has been dull, and a fairly sharp decline was experienced in the early part of this week. In the East the price has also fallen. There is nothing definite to report as to the Bolivian situation, and the general outlook is rather uncertain.

The Eastern Price on Thursday morning was equivalent to £965 5s. c.i.f. Europe. On Thursday afternoon the market was steady.

In lead the London market rallied from the low figure of £86 touched on the 15th instant, but has gradually eased off again and on the 22nd inst. dropped to £80 per ton, the lowest price since the reopening of the market. Producers have been selling almost daily and consumers have not shown any anxiety to cover requirements except their immediate needs. At the time of writing the market has a weak appearance, but the trend may change should there be any considerable increase in consumer demand. Producers in America are reluctant to follow the London market, but in view of sales having been made there from this side at 12¼c. per lb. c.i.f., duty paid, they were forced to cut their price to 13½c. per lb. on Wednesday. On Thursday afternoon the market was firmer.

There is very little to report on zinc, but with the possibility of the London market reopening in the not too distant future it is likely that consumers may curtail purchases to a minimum in the meantime.

The demand for copper here and on the Continent seems to show signs of falling off, and it is doubtful whether the demand in America for high-priced Chilean metal will continue indefinitely.

CLOSING PRICES AND WEEK'S TURNOVER

	October 16		*October 23*	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Tin				
Cash	£966	£967	£951 10s.	£952 10s.
Three months	£949	£950	£941 10s.	£942 10s.
Settlement	£967		£952	
Week's turnover	805 tons		340 tons	
Lead				
Current month	£88 5s.	£88 10s.	£82 15s.	£83 0s.
Three months	£88 5s.	£88 10s.	£82 10s.	£82 15s.
Week's turnover	5,425 tons		6,350 tons	

Iron and Steel

Output of ingot steel next year should easily beat the existing record of 16,250,000 tons and this year's production should be at least 16,000,000 tons. This is the considered opinion of Mr. Duncan Sandys, Minister of Supply, expressed in a written reply to a question in the House of Commons. It is amply confirmed by the known facts. Last month, production was running at an annual rate of well over 17,000,000 tons and it is still rising.

Consumers, however, complain that the spectacular expansion of output is not reflected in the deliveries of finished material. Distribution is still on a very restricted scale. Only very small increases in the allocations have thus far been sanctioned and it is felt that the urgency of industrial requirements has not been matched by a corresponding effort to get available material into circulation.

The recent increase in pig iron prices has not affected the quotations for British steel. In fact, the price of galvanized sheets has been cut by 7s. per ton owing to the further fall in zinc, and as German and American steel prices were recently increased, British quotations are well below world levels.

The intake of foreign scrap shows no improvement, but the aggregate tonnages collected from home sources is on a somewhat better scale. There is still an avid demand for heavy melting steel scrap but foundries have fairly good stocks of cast iron scrap.

U.K. METAL & MINERAL IMPORTS—SEPTEMBER

	Units	*Sept. 1952*	*Jan.-Sept. 1951*	*Jan.-Sept. 1952*	*Increase or decrease in 1952 over 1951*
Non-ferrous metals and manufactures:					
Aluminium and alloys	Cwt.	340,742	2,667,604	3,570,927	+840,323
Bismuth*	Lb.	51,680	450,752	456,452	+ 5,700
Cadmium	Lb.	63,422	1,137,877	1,308,521	+170,644
Cobalt and alloys	Lb.	381,016	2,499,462	2,575,075	+ 75,613
Copper:					
Electrolytic	Tons	14,427	174,097	164,919	− 9,178
Other	Tons	14,565	101,409	125,332	+ 23,923
Lead	Tons	10,532	110,859	113,526	+ 2,667
Mercury	Lb.	Nil	1,134,597	464,368	−670,229
Nickel	Cwt.	11,323	76,215	95,773	+ 19,558
Tin	Tons	114	7,021	2,672	− 4,349
Zinc	Tons	16,865	86,061	176,492	+ 90,431
Ores and Concentrates:					
Antimony ore and conc.	Tons	150	19,242	15,885	− 3,357
Bauxite	Tons	17,957	262,927	192,934	− 69,993
Chromium ore	Tons	11,588	107,862	132,824	+ 24,962
Iron pyrites†	Tons	48,205	265,897	351,181	+ 85,284
Manganese ore	Tons	44,582	303,615	326,319	+ 22,704
Molybdenum ore	Cwt.	991	48,268	51,633	+ 3,365
Nickel ore, conc. & matte	Tons	2,812	27,008	26,671	− 337
Tin ore and conc.	Tons	5,222	36,367	41,938	+ 5,571
Titanium:					
Ilmenite	Tons	5,000	64,814	83,237	+ 18,423
Other sorts	Tons	724	7,253	6,742	− 511
Tungsten ore	Tons	701	3,400	6,170	+ 2,770
Zinc ore and conc.	Tons	43,762	134,964	150,385	+ 15,421
Non-metalliferous mining products:					
Asbestos	Tons	10,552	88,535	94,137	+ 5,602
Magnesite	Tons	1,455	17,888	17,935	+ 47
Sulphur	Tons	33,275	318,433	327,904	+ 9,471

*Excluding bismuth alloys. †Including cupreous iron pyrites.

OCTOBER 23 PRICES

COPPER

Electrolytic ... ... £285 0 0 d/d

LEAD AND TIN

(See our London Metal Exchange report for Thursday's prices)

ZINC

G.O.B. spelter, foreign, duty paid ... £118 0 0 d/d
G.O.B. spelter, domestic ... ... £118 0 0 d/d
Electrolytic and refined zinc ... ... £122 0 0 d/d
Special high grade ... ... £124 0 0 d/d

ANTIMONY

English (99%) delivered, 10 cwt. and over ... ... £225 per ton
Crude (70%) ... ... £210 per ton
Ore (60% basis) ... ... 20s. — 22s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) ... ... £454 per ton

OTHER METALS

Aluminium, £166 per ton.
Bismuth, 17s. lb. (min. 2 cwt. ex-warehouse).
Cadmium, (Empire) 14s. 4d. lb.
Chromium, 6s. 6d. lb.
Cobalt, 20s. lb.
Gold, 248s. f.oz.
Iridium, £60 oz. nom.
Magnesium, 2s. 10½d. lb.
Manganese Metal (96%-98%) 2s. 2d./2s. 3d. per lb. d/d
Osmiridium, £40 oz. nom.
Osmium, £65/£70 oz. nom.
Palladium, £715s./£810s. oz.
Platinum, £27/£33 5s.
Rhodium, £42 10s. oz.
Ruthenium, £25 oz.
Quicksilver, £64 10s. ex-warehouse
Selenium, 25s. nom. per lb.
Silver 73d. f.oz. spot and f'd.
Tellurium, 18s./19s. lb.

ORES, ALLOYS, ETC.

Bismuth ... ... 40% 7s. 6d. lb. c.i.f.
30% 6s. 3d. lb. c.i.f.

Chrome Ore—
Rhodesian Metallurgical (lumpy) £14 2s. per ton c.i.f.
,, ,, (concentrates) £14 2s. per ton c.i.f.
,, ,, Refractory £13 14s. per ton c.i.f.
Baluchistan Metallurgical ... £15 8s. per ton c.i.f.
Magnesite, ground calcined ... £26 - £27 d/d
Magnesite, Raw ... ... £10 - £11 d/d
Molybdenite (85% basis) ... 105s. 10d. per unit c.i.f.
Wolfram (65%) ... ... 410s. c.i.f. U.K. buying
,, ,, ... 447s. 6d. d/d U.K. selling
Scheelite ... ... 400s.
Tungsten Metal Powder (for steel manufacture) ... 31s. 7d. nom. per lb. (home)
Ferro-tungsten ... ... 28s. 7d. nom. per lb. (home)
Carbide, 4-cwt. lots ... ... £32 3s. 9d. d/d per ton
Ferro-manganese, home ... £49 0s. 8d. per ton
Manganese Ore U.K. (48% - 50%) ... ... 6s. per unit
Brass Wire ... ... 2s. 8¼d. per lb. basis.
Brass Tubes, solid drawn ... 2s. 3d. per lb. basis.

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Markets during the past week were distinctly uninteresting. The investing public are clearly having difficulty in making up their minds whether we are in a deflationary or an inflationary period. The lack of balance in our overseas trade figures, large budget deficits, and increased wages, all make a case for inflation. On the other hand a high bank rate, falling commodity values, stiffer export markets and a fretful Wall Street, can all argue for deflation. The investor is therefore in a quandary. If the inflationary trend is going to prevail he should buy equities; if the deflationary, government bonds or gold shares. In fact, he does not know and so does nothing. This uncertainty has persisted over most of the current year. One thing is clear; markets are thin and a sudden movement either way could cause very sharp adjustments to price levels.

Kaffirs were all marked down. The riots in East London, added to the general effect of the Rhodesian strike and Kenya Mau Mau trouble, caused this. It is emphasized in Johannesburg that native miners on the Rand are organized on a tribal basis and there are no native unions; extensive native labour trouble is therefore unlikely. Later in the week a better tone was apparent, and it was rumoured that some finance houses were supporting the Johannesburg market. In these circumstances, little attention was paid to the Anglo American group quarterly figures. As with other mines, receipts from premium sales were down although working profits were in some instances higher.

Western Holdings sampled 1,280 ft. of Basal reef obtaining 91 per cent payability averaging 90.18 dwt. over 8.67 in., equivalent to 782 in.-dwt. Stilfontein reported sampling of 2,430 ft. of Vaal reef. 91 per cent proved payable averaging 45.8 dwt. of 5.7 in. equivalent to 261 in.-dwt. The first quarter's production of the mine, which started on July 1, produced a working profit of £5,518, a total of £431,083 was expended in the quarter in connection with uranium. Virginia Gold reported payability of 71 per cent last quarter; values averaged 321 in.-dwt.

West African shares followed the general trend. Ashantis eased but stock was reported to be in short supply at lower levels. Taquah shares were marked down to a nominal 2s. 6d. The chairman's statement made it plain that the mine was not an economic proposition under existing conditions and it might be necessary to close it down. New Consolidated Goldfields and Ashanti, however, have recently advanced the company £70,000 and market opinion hopes that some reorganization of management may bring about happier results to make such a drastic remedy unnecessary. Bremang Gold produced excellent figures for the month of September; an aggregate working profit of £23,660 was achieved compared with £17,353 in August.

Coppers were all marked down on the native strike in Northern Rhodesia. It is estimated that the shut down will cost the mines around £250,000 per day. In later dealings, Rhokana rallied on rumours of good results expected in the coming figures and the possibility of a split in the shares. Chartered declared another interim dividend of 13⅓ per cent, the same as last year. The shares have recently been a weak market.

Tins were all marked down on the lower metal price although the end of the week saw a steadier tendency. It is difficult to get a fair picture while the market remains untested in present stagnant trading conditions. The Bank of England has sent a memorandum to the Metal Exchange on trading which is stated to have taken place in tin using cheap sterling. It is, of course, virtually impossible to prevent this where the metal never enters this country, but it seems that an indirect effect has been the considerable strengthening of transferable sterling overseas. This, in itself, is desirable.

Lead/zinc issues were again down on the unfavourable view taken of the future of the metal price. Some of the lower grade mines may have to close if zinc continues to fall on the free market. Dollar issues all moved downwards following malaise on Wall Street.

	Price Oct. 22	+ or − on week
FINANCE		
African & European	2⅜	−⅛
Anglo American Corpn.	6	−⅛
Anglo-French	19/4½	
Anglo Transvaal Consol.	25/7½	
Central Mining (£1 shrs.)	31/10½	−1/3
Consolidated Goldfields	42/6	−1/10½
Consol. Mines Selection	24/4½	−7½d
East Rand Consols	2/4½	
General Mining	4	
H.E. Prop.	30/7½	−7½d
Henderson's Transvaal	9/3	+3d
Johnnies	46/10½	−2/6
Rand Mines	3⅜	−⅛
Rand Selection	35/7½	−1/10½
Strathmore Consol.	26/3	
Union Corp. (2/6 units)	30/3	−9d
Vereeniging Estates	3⅜	−⅛
Writs	29/4½	−7½d
West Wits	40/7½	−1/10½
RAND GOLD		
Blyvoors	40/9	−3d
Brakpan	15/9	−6d
City Deep	28/1½	−7½d
Consol. Main Reef	30/-	−7½d
Crown	36/3	−1/10½
Daggas	3⅛	−⅛
Doornfontein	23/6	−1/6
Durban Deep	2⅜	−⅛
E. Daggas	17/6	
E. Geduld ... (4/- units)	39/4½	−1/3
E. Rand Props	3⅜	−⅛
Geduld	5⅛	
Govt. Areas	12/-	−3d
Grootvlei	26/10½	−1/10½
Libanon	11/4½	−4½d
Luipaards Vlei	20/6	−1/6
Marievale	19/9	
Modderfontein East	21/3	−1/3
New Kleinfontein	26/3	−7½d
New Pioneer	13/3	−6d
Randfontein	23/3	−9d
Robinson Deep	10/-	−6d
Rose Deep	22/6	−7½d
Simmer & Jack	5/3	−6d
S.A. Lands	3⅜	−1/3
Springs	6/6	−3d
Stilfontein	22/6	−6d
Sub Nigel	41/3	−1/10½
Van Dyk	11/9	−3d
Venterspost	16/7½	−1/10½
Vlakfontein	16/3	−3d
Vogelstruisbult	3/-	−3d
West Driefontein	5⅜	−⅛
W. Rand Consolidated	50/7½	−7½d
Western Reefs	43/9	−7½d
O.F.S.		
Freddies	7/-	−3d
Freddies N.	8/1½	−1½d
Freddies S.	7/1½	−4½d
F.S. Geduld	2⅜	−⅛
Geoffries	16/-	+3d
Harmony	19/9	+1½d
Loraine	6/7½	−4½d
Lydenburg Estates	10/-	
Merriespruit	4/-	−3d
Middle Wits	14/9	
Ofsits	38/1½	−1/3
President Brand	19/6	−1/6
President Steyn	17/6	−1/4½
St. Helena	15/-	−9d
U.F.S.C. & G.	6/4½	−1½d
Virginia Ord.	12/6	−6d
Welkom	20/-	−1/3
Western Holdings	3⅜	−⅛
WEST AFRICAN GOLD		
Amalgamated Banket	1/6	−1½d
Ariston	5/10½	−3d
Ashanti	16/6	−3d
Bibiani	5/9	−3d
Bremang	2/3	+1½d
G.C. Main Reef	3/6	−1½d
G.C. Selection Trust	6/3	−4½d
Konongo	2/3	
Lyndhurst Deep	1/-	
Marlu	1/4½	
Taquah & Abosso	2/6	−6d
AUSTRALIAN GOLD		
Boulder Perseverance	2/-	
Gold Mines of Kalgoorlie	10/-	−1½d
Great Boulder Prop.	5/3	
Lake View and Star	16/6	+6d
Mount Morgan	17/9	−9d
North Kalgurli	11/10½	+1½d
Sons of Gwalia	7/-	
South Kalgurli	7/3	−3d
Western Mining	9/6	−3d
MISCELLANEOUS GOLD		
Cam and Motor	41/10½	+7½d
Champion Reef	5/9	−3d
Falcon Mines	8/9	
Globe & Phoenix	25/-	
G.F. Rhodesian	6/-	−3d
London & Rhodesian	4/10½	−1½d
Motapa	1/9	−3d
Mysore	3/-	
Nundydroog	4/9	−3d
Ooregum	2/6	
Oroville	11/3	+3d

	Price Oct. 22	+ or − on week
MISCELLANEOUS GOLD (contd.)		
St. John d'El Rey	25/- xd	−7½d
Zams	34/9 xd	−1/9
DIAMONDS & PLATINUM		
Anglo American Inv.	4⅜	−⅛
Casts	26/3	−1/9
Cons. Diam. of S.W.A.	4⅛	
De Beers Defd. Bearer	61/9	−3/3
De Beers Pfd. Bearer	14⅛	−⅛
Pots Platinum	9/-	−1½d
Watervaal	15/-	
COPPER		
Chartered	56/3	−2/9
Esperanza	3/10½	
Indian Copper	4/9	+6d
Messina	4⅜	−⅛
Nchanga	6⅜	−⅜
Rhod. Anglo-American	58/3	−2/-
Rhod. Katanga	14/3	−10½d
Rhodesian Selection	17/3 xd	−9d
Rhokana	21⅜	−1
Rio Tinto	24	−1
Roan Antelope	13/4½ xd	−1/-
Selection Trust	40/9	−1/9
Tanks	60/9	−2/-
Tharsis Sulphur Br.	45/-	
TIN (Eastern)		
Ayer Hitam	24/6	−1/3
Bangrin	7/9 xd	−9d
Gopeng	11/-	−6d
Hongkong	7/6	−3d
Ipoh	21/10½	
Kamunting	11/- xd	−6d
Kepong Dredging	7/6	−3d
Kinta Tin Mines	11/9	−6d
Malayan Dredging	23/-	−6d
Pahang	16/6	−9d
Pengkalen	10/3	−3d
Petaling	14/4½	−1½d
Rambutan	13/-	
Siamese Tin	21/3 xd	−1/10½
Southern Kinta	14/9 xd	−7½d
S. Malayan	25/6	−1/3
S. Tronoh	12/6	−3d
Sungei Kinta	18/9	−7½d
Tekka Taiping	7/9	+3d
Tronoh	22/6	−1/-
TIN (Nigerian and Miscellaneous)		
Amalgamated Tin	10/7½ xd	−4½d
Beralt Tin	29/1½ xd	−1/7½
Bisichi	4/6	−1½d
British Tin Inv.	14/9	−6d
Ex-Lands Nigeria	5/-	−1½d

	Price Oct. 22	+ or − on week
TIN (Nigerian and Miscellaneous) contd.		
Geevor Tin	13/9	−3d
Gold & Base Metal	3/7½	−1½d
Jantar Nigeria	10/10½	−1½d
Jos Tin Area	10/-	−3d
Kaduna Prospectors	4/-	
Kaduna Syndicate	4/3	−3d
London Tin	5/3	−1½d
United Tin	2/9	−1½d
SILVER, LEAD, ZINC		
Broken Hill South	46/10½	
Burma Corporation	1/7½	
Consol. Zinc	22/3	−1/6
Lake George	12/6	−10½d
Mount Isa	34/3	−1/-
New Broken Hill	22/6	
North Broken Hill	51/11 xd	−1/7½
Rhodesian Broken Hill	14/3	−6d
San Francisco Mines	25/9	−2/-
Uruwira	4/-	
MISCELLANEOUS		
BASE METALS & COALS		
Amal. Collieries of S.A.	47/6	−7½d
Associated Manganese	38/6	−1/3
Cape Asbestos	18/4½	
C.P. Manganese	48/10½	−1½d
Consol. Murchison	26/3	−1/3
Mashaba	8d	
Natal Navigation	3⅜	
Rhod. Monteleo	12/6	−3d
Turner & Newall	95/-	+6d
Wankie	16/9	−1/-
Witbank Colliery	50/-	
CANADIAN MINES		
Dome	$37½	+$1
Hollinger	$30½	−$½
Hudson Bay Mining	$111	−$4
International Nickel	$82½	−$4½
Mining Corpn. of Canada	£5½	−£⅜
Noranda	$152	−$3
Quemont	£6½	−£½
Yukon	4/1½ xd	−1½d
OIL		
Anglo-Iranian	5⅛	−⅜
Apex	43/1½	−7½d
Attock	23/1½	+7½d
Burmah	44/4½	−1/1½
Canadian Eagle	34/10½	+1/7½
Mexican Eagle	23/10½	−1½d
Shell (bearer)	4⅜	−⅜
Trinidad Leasehold	30/6	−6d
T.P.D.	25/7½ xd	−7½d
Ultramar	28/9	−3d

COMPANY NEWS AND VIEWS

Stock Exchange Commissions

Readers may be interested in details concerning the controversy over Stock Exchange commissions. This has received a considerable amount of publicity in the daily Press. Without going into technicalities, the general effect of the adjustment will be an increase at varying rates but probably averaging around 40 per cent. On certain types of security, the rate of commission has been reduced. The main increases will operate on stocks quoted per cent, bonds to bearer, and American securities. In recent years, the return on such business has hardly been worthwhile. Reductions are proposed in the percentage allowed to agents.

The basic outline of the case is clear. There has been no large alteration in the rate of Stock Exchange commissions since 1912. Most firms find that their operating expenses are at least double what they were before the 1939/45 war and are probably not less than four times as much as in 1912. This increase can be accounted for by the wages which have to be paid to skilled staff, the high price of stationery, ledgers, postage, telephone and cables, and post-war increases in rent. It seems probable that the Stock Exchange is among the few professions whose charges have not risen since the end of the last war, and when compared with 1912, must be almost unique.

Opposition has mainly centred under three heads:

(1) that it is not the time to increase costs to the public when money is dearer and capital is scarce;

(2) that it is unfair to reduce the percentage payable to such concerns as merchant bankers and other institutions which maintain substantial staffs to deal with investment matters;

(3) a large number of jobbing firms in the gilt-edged market are understood to have protested against the proposed increase of brokerage on gilt-edged securities as they fear it might decrease the volume of business going through the House.

While there is clearly something to be said on both sides, the Council have sound backing for their proposals.

In answer to the first point, it is clear that many smaller firms catering for the private and smaller investor would be forced out of business unless some adjustment were soon made. Many of the objectors on general grounds appear to be those handling institutional business where the average return per bargain is proportionately greater. In this connection, a reduction in the vindictive 2 per cent stamp duty would probably help matters.

As regards the second point, the previous tentative scheme which was put forward in 1949 was mainly criticized because no reduction was contemplated for the banks while other agents were discriminated against. It is, after all, the Stock Exchange which has to maintain complete facilities for providing a market. If people wish to deal through banks, it is surely right that they should pay for the additional work involved.

The point raised by the gilt-edged jobbers appears to be a sectional view of the problem. It is true that many brokers carrying out institutional business in money stocks during the past few years have had to cut their commissions on large transactions to a rate that cannot be economic. Some small increases is clearly desirable. Safeguards remain for a sharp reduction of commission on very large orders. On the other hand, small transactions cost a good deal to put through and it is only right that these should at least pay for themselves.

To sum up, it is the duty of the House to provide an efficient and free market. The expenses of doing so have shot up like everything else since the end of the war and some adjustment in commissions seem justified if facilities for the public are to be maintained.

Rhokana and "Rhoanglo" Pay More

The preliminary profit figures for Rhokana Corp. for the year to June 30 last reveal a profit before tax of £12,116,457 compared to £10,483,687 in the preceding year. £640,000 of this year's profit is, however, of an exceptional nature due to sales made possible through the erosion of stocks which will have to be made good when normal trading conditions return. The benefits of emigration are clearly reflected in the provision for taxation which is no more than £4,255,535 leaving a net profit of £7,860,922 compared with £6,765,395 in the preceding year. The final dividend on the £1 stock units is being increased to 35s. making a total distribution of 45s. for the year as against 40s.

The preliminary figures for Rhodesian Anglo American for the year to June 30 last are set out in detail on page 468. It will be seen that the pattern of these figures is substantially the same as for Rhokana and that dividend payments for the year on the 10s. stock unit are also increased at 6s. 3d. against 5s. 6d.

It will thus be apparent that rising costs for these companies have been more than offset by the higher copper price which ruled during the year and by a somewhat improved fuel position. Prospects on the Copperbelt for the current year are temporarily under a cloud until the outcome of the strike of African mineworkers can be settled but any pessimism which may be felt can be tempered by the knowledge that a much enhanced copper price has been ruling since June and that so long as coal stocks can continue to be delivered and unloaded by white labour much of the lost production caused by the strike can be subsequently made up.

Mount Morgan's Impressive Showing

The Report for the year ended 28th June, 1952, of Mount Morgan Ltd. confirms the good impression created by the preliminary figures. The present company, which is domiciled in Australia, acquired, some twenty or more years ago, the famous Mount Morgan mine situated in Queensland. It is an open-cast proposition from which gold, copper and silver are produced, together with coal which, augmented by outside supplies, is used for the company's own plant.

The tonnage milled during the 52-week period amounted to 892,250 tons, which was 27,350 tons more than in the previous year. Gold/copper concentrates produced amounted to 43,645 tons—the metal contents being 62,610 oz. gold and 5,400 tons copper. Operating costs rose to 31s. 5d. against 24s. 2d. Revenue amounted to £2,448,273 and after allowing for all expenditure, depreciation, etc., and adding interest on investments, the net profit for the year was £385,578. This compares satisfactorily with the previous year's figure of £370,707. Dividend on the Ordinary was 2s. per share. A one-for-three scrip bonus was announced in mid-year by the company who took the view that in deciding on the revaluation of assets, the figure of £53,370 for leases and freehold property was unrealistic and should be written up to £1,103,370.

In his report, the Managing Director gives an interesting survey of operations. There was increased production in all departments but steep rises took place in wages and stores, while rail and sea freight charges also rose. The power house operated without interruption and the research section included a comprehensive range of testing and experimental work. Coal from the Dawson Valley Colliery was lower at 29,050 tons. No additions were made to ore reserves and the estimated total treatable material is 14,500,000 tons of average grade: gold, 2.70 dwt. per ton and copper 1.02 per cent.

Rand Leases Lower Profit and Dividend

Like other Rand producers, Rand Leases has had to forecast lower dividends as a result of capital expenditure requirements.

Although the tonnage dealt with at the mine during the year to June 30, 1952 was slightly lower at 2,218,000 tons (against 2,222,000 tons), the yield was better at 371,786 oz. consequent upon an up-grading of the ore—3.352 dwt. against 3.245 dwt. The working profit declined to £954,806 averaging 8s. 7d. per ton crushed as compared with £1,114,667 or 10s. per ton. Working costs rose by 2s. 9d. to 33s. 6d. The dividend was scaled down to 3s. 1½d. per share compared with 4s., and although there is nothing said in the report or the chairman's statement which accompanies it, the indications are that a further drop in distributions is not unlikely.

Development results, however, look quite satisfactory, although the total footage last year was down being 71,532 ft. as against 82,554 ft., which included 4,879 ft. advanced on Bird

Reef and 12,789 ft. on Kimberley Reef. Footage sampled on Main Reef series was 21,790 ft. of which 58 per cent was payable of an average value of 14.58 dwt. Sampling of the 3,720 ft. of Bird Reef gave 37 per cent payability averaging 3.92 dwt., while 32 per cent of the 8,285 ft. of Kimberley Reef sampled was classed as payable averaging 4.40 dwt. The fully developed ore reserve on the Main Reef series calculated on a price of £12 8s. 3d. per oz. for gold and working costs as anticipated at the end of the financial year, amounted to 4,133,000 tons of 4.33 dwt. over 41 in. Compared with the previous year, when working costs were lower, this shows a decrease of 342,000 tons. In addition, there is a further large tonnage of payable ore standing in pillars, etc., as well as also tonnages of ore blocked out on the Bird and Kimberley Reefs.

Rising Costs Cut Profits at Libanon

The decrease in tonnage milled, together with the sharp rise in working costs per ton, of Libanon Gold Mining during the year to June 30 last more than offset any advantages that might have accrued to the company from a higher gold output.

Year to June 30	Milled	Grade	Yield	Per ton milled Cost		Profit		Working* Profit
	tons	dwt.	oz.	s.	d.	s.	d.	£
1952	955,000	3.8	181,968	38	4.9	10	9.9	516,937
1951	986,000	3.6	178,299	33	9.5	12	10.1	632,931

*Includes revenue from premium gold sales.

The adverse effects of the lower tonnage throughput and higher working costs were reflected in the working profit which was lower by £115,994. Taxation was negligible, £8 against £7, but even so, after doubling the dividend distribution which required £198,432 the allocation to reserve had to be cut considerably and the balance carried forward was slightly weaker than the amount brought forward from the previous year.

Year to June 30	Total Revenue	Expenses	Dividend	Net* Profit	To Reserve	Carry Forward
	£	£		£	£	£
1952	536,575	34,610	6d.	501,957	306,689	6,175
1951	651,324	37,366	3d.	613,951	505,396	9,339

*After deducting tax liabilities of £8 in 1952 (1951—£7).

Development work was on a bigger scale, the advance totalling 71,233 ft. compared with 62,273 ft. in 1951. The footage sampled amounted to £32,520 ft. of which 19,905 ft., or 58.7 per cent proved payable at an average value of 5.9 dwt. per ton over an estimated stoping width of 59.1 in.

The annual meeting will be held in Johannesburg on November 12. Dr. W. J. Busschau is chairman.

Basal Reef Believed to Underlie Whole of Harmony's Property

Harmony Gold Mining, the potentially promising Orange Free State developing mine, has announced over the last two weeks that borehole LR8 on farm La Riviera, situated in the Virginia area of the O.F.S., intersected the Basal Reef at 5,044 ft. assaying 42.9 dwt. per ton over a true width of 33.5 in., equivalent to 1,437 in.-dwt. Some loss of core in the Basal Reef occurred due to grinding. This borehole, which is sited 3,000 ft. east-south-east of borehole LR4, was drilled to assist in planning future operations at the mine and in the first deflection the Basal Reef was intersected at 5,041 ft. assaying 61.3 dwt. over a true width of 25 in., equivalent to 1,532 in.-dwt., while further deflections have yielded 1,897 in.-dwt. and 1,817 in.-dwt. again with some core loss.

In this connection, the company's annual report covering operations for the year ended June 30 last, states that further confirmation of the company's prospects was obtained during the year from boreholes LR5, LR6 and LR7 which were drilled to the north of the Harmony lease area by New Consolidated Free State Exploration and gave values averaging 801 in.-dwt. Apart from the values disclosed, the chairman said these three boreholes were important as they indicated that the Basal Reef probably underlies nearly the whole of the Harmony Lease Area.

At June 30 last, the company's net cash position totalled £2,678,329 and comprised deposits and cash totalling £2,942,178 less creditors and provisions of £263,849. The company's net resources are believed to be sufficient to finance operations at the property until the middle of 1953, after which, the chairman declared, it will be necessary to make fresh financial arrangement to enable work to be carried on to the production stage.

The annual meeting will be held in Johannesburg on November 21, Mr. J. V. R. Richdale is chairman.

Kent (F.M.S.) Pays 100 per cent

The appreciable improvement in the grade of ground worked by Kent (F.M.S.) Tin Dredging during the calender year 1951 more than compensated for the smaller dredge throughput, and total production showed an increase of 35 tons over 1950.

Year to Dec. 31	Per cubic yard Dredged (000)	Yield (lb.)	Cost (pence)	Output (tons)	Per ton ore Cost £	Price £
1951	1,718	0.72	11.6	549	151	616
1950	1,751	0.65	11.1	514	158	449

Costs were held down remarkably well and with an improvement in the price received per ton tin ore by approximately £167, mining revenue rose by more than £128,000. Unfortunately, the U.K. and Malayan exchequers cut heavily into earnings and the company's total tax liabilities to government funds, including royalty payments to the Malayan Government of £63,595, amounted to no less than £211,063. Nevertheless, net earnings were sufficient to raise the aggregate distribution for the year to 100 per cent which required £55,125, allocate £20,000 (same) to general reserve, provide £13,690 (£1,531) for depreciation and to leave the carry forward stronger by nearly £7,000 at the fiscal year end.

Year to Dec. 31	Mining Revenue	Mining Costs	Tax	Net Profit	Dividend %	Carry Forward
	£	£	£	£		£
1951	409,437	82,929	147,468	95,850	100	30,203
1950	280,945	81,115	83,714	60,245	57½	23,168

The foregoing results, Mr. Stanley Wickett, chairman, states, must be regarded as exceptional and due to the record high prices received for tin ore during the early part of the year and to the large output produced by the dredge when working high grade ground.

The outlook for the current year is reasonably good. Although the price received per ton tin ore will be lower a high average price level has been maintained throughout the year, and if costs can again be held down the final results should be satisfactory. Production for the first nine months of the current year total 332 tons compared with 398 tons in the corresponding period of the previous year. The annual meeting will be held in Redruth, Cornwall, on November 7.

SEPTEMBER TIN OUTPUT IN TONS OF TIN CONCENTRATES

Company	Sept.	Months since year end	Financial Year to Date This	Last	Company	Sept.	Months since year end	Financial Year to Date This	Last
EASTERN					**Eastern (contd.)**				
Ampat	49	9	741	730	Sungei Kinta	29	9	185	391
Ayer Hitam	169‡	3	169	491	Sungei Way	148‡	3	148	58
Bangrin	45	9	425	811	Tambah	17	9	102	145
Batu S.	22	12	284	216	Tanjong	64	9	778	949
Berjuntai	76	5	384	243	Tekka	30‡	6	55	43
Chenderiang	43‡	6	81	80	Tekka-Taiping	28‡	11	199	259
Gopeng	200‡	12	856	801	Temoh	74‡	3	74	65
Hongkong	70‡	12	239	355	Tongkah	82	3	229	153
Ipoh	67‡	6	191	331	Tronoh	586‡	9	1431	1112
Jelapang	37	9	248	228					
Kampong	32	6	155	216					
Kamunting	132	6	1114	1301	**NIGERIA**				
Kent (F.M.S.)	119‡	9	332	398	Amal. Tin	324	6	2098	2260
Kepong	81‡	3	81	79	" "	53*	6	222	132
Killinghall	142‡	12	620	467	Bisichi	39	9	420	464
Kinta K.	11	6	70	88	" "	8*	9	119	118
Kinta Tin	24	9	207	282	Ex-Lands	44	9	425	434
Klang River	25	6	182	174	Filani	9	9	62	39
Kuala K.	141	6	949	1116	Gold & Base	156‡	9	430	392
Kuchai	57	12	814	741	" "	N.A*	9	18	17
Lahat	31‡	6	70	72	Jantar	20	12	256	266
Larut	44	9	577	659	"	20*	12	214	232
Lower Perak	72	5	385	352	Jos	15	2	30	31
Malayan Tin	602‡	3	602	108	Kaduna P.	6	9	60	50
Malaysiam	7	6	33	31	Kaduna S.	23	9	178	194
Pahang	220	2	440	480	Keffi	28	6	134	116
Pari Tin	8‡	3	8	18	N'guta Ex.	8	9	63	74
Pengkalen	120‡	12	531	557	N'guta K.	17	9	97	124
Petaling	430‡	12	1949	2136	N'guta T.	20	9	222	177
Puket	123‡	9	360	356	" "	2*	9	39	40
Rahman	46	3	114	157	Ribon	13	6	45	29
Rambutan	22‡	3	22	18	Rukuba	2	6	10	10
Rantau	71	3	203	121	S. Bukeru	5†	9	43	48
Rawang Con.	48	6	281	327	Tin Fields	2	6	10	12
Rawang Tin	29	6	402	612	U. Tin	15	3	36	34
Renong	20	3	68	238					
Selayang	105	12	352	274	**MISC.**				
Siamese	434	9	1279	1141	Beralt	12	6	70	23
S. Kinta	333	9	2384	1916	"	184†	6	1120	1124
S. Malayan	658‡	3	658	854	Geevor	50	6	280	365
S. Tronoh	180‡	9	454	650	S. Crofty	45	9	340	218
Sungei Best	206‡	6	470	543	"	—	9	1¼	4¼

*Columbite. †Wolfram ‡Three months' figures

Company Shorts

Taquah & Abosso's Uncertain Future.—Speaking at the annual general meeting of Taquah & Abosso mines this week the chairman, Mr. Robert Annan, indicated that it might be necessary to close down the mine to prevent a dissipation of assets. Reporting that no satisfactory offer of assistance had been forthcoming from the Gold Coast Government in response to their application, he said that under present conditions the mine was not an economic proposition. Only an increase in the gold price or a drastic reduction in costs could alter the situation and he saw little prospect of either at the present time. They were carrying on for the time being because the more plentiful labour season was just being reached. If they could crush 23,000-24,000 tons a month they could pay their way on a cash basis for a time, but eventually shortage of development would bring them to a standstill. It would be very expensive to put the mine on a care and maintenance basis.

The company made a net loss for the year to March 31, 1952, of £32,807 against a profit of £92,070 in the preceding year, and the carry forward to the balance sheet shows a substantial decline of £60,492 compared with £130,600.

Rosterman's Interest in Uganda.—It will be recalled that last year Rosterman Gold Mines secured a special exclusive prospecting licence over an area of about 50 sq. miles in the South Kigezi district extending to the border of the Belgian Congo, near which the Belgians are operating a substantial wolfram mine. This licence was granted to a new company formed in Uganda, under the title Rosterman (Uganda) Ltd. It is now announced that the ownership of this new company has been transferred to the Kabale Mining Co. Ltd. under an agreement whereby Rosterman Gold Mines will participate through a shareholding in Kabale Mining, in a further and larger special exclusive prospecting licence, and another exclusive prospecting licence from which wolfram is already being won.

Vaal Reefs Deal with Hartebeestfontein.—Vaal Reefs Exploration and Mining report the conclusion of an agreement with Hartebeestfontein Gold Mining, one of the companies formed to mine the Lucas Block, whereby Hartebeestfontein will receive an area of 432 claims on the remaining extent of Farm Zandpan No. 43 which is to be included in the area over which this company has applied for a mining lease. The consideration to be paid to Vaal Reefs consists of £21,000 in cash and this company has further undertaken to subscribe at par for 280,000 5s. shares in the initial capital of Hartebeestfontein Gold Mining.

Enthoven Subsidiary Company.—H. J. Enthoven & Sons, smelters and refiners of lead, and manufacturers of non-ferrous metals for over a hundred years, have formed a subsidiary company entitled, Enthoven Solders Ltd., which will market the parent company's solder and solder specialities.

Mr. Charles E. Oliff-Lee, hitherto chairman and managing director of A. Strauss & Co., has been compelled for health reasons to resign all the offices held by him in the Strauss Group of Companies. His resignation took effect from September 9, 1952. Mr. Oliff-Lee will, however, retain his connection with the company in the capacity of consultant.

Death of Col. Walker.—The death occurred last week of Col. J. S. A. Walker, T.D., J.P., who was vice-chairman of the well-known engineering firm of Walker Bros. (Wigan) Ltd. He was sixty-five.

Mr. William Mure, director of Amalgamated Metal Corporation, has been elected chairman of the council of the Zinc Development Association in succession to **Mr. S. C. Hunn,** who has retired.

Mr. W. M. Warren has been appointed to the Board of Amalgamated Tin Mines of Nigeria and **Mr. A. L. Butler** has resigned.

Sir Reginald W. A. Leeper has been appointed a director of Consolidated African Selection Trust.

Mr. Philip J. Oppenheimer has been appointed a director of Sierra Leone Selection Trust Ltd.

The International Refining Co. Ltd. announce that both their London offices and works are now situated at Roding Hill Works, Roding Lane North, Woodford Bridge, Essex. Telephone: WANstead 7741.

S. J. Barnett: Change of Address.—S. J. Barnett & Co. have announced that their offices are now at Greenwich House, 10/13 Newgate Street, London, E.C.1. Telephone: City 8401. Inland telegrams: Barlomet, Cent. London.

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SIAMESE TIN SYNDICATE LTD.

RECORD PROFIT

MR. KENNETH O. HUNTER'S STATEMENT

The Forty-Fifth Annual General Meeting of the Siamese Tin Syndicate Ltd. was held on October 23 in London, **Mr. Kenneth O. Hunter,** Chairman, presiding.

The following is an extract from his circulated statement for the year 1951:—

The output of tin during the year from dredging operations (including those of the wholly owned subsidiary) amounted to 1,564 tons as compared with 1,525 tons in 1950. In addition a further 61 tons were produced from the re-treatment of tin shed tailings, giving a total production of 1,625 tons which is slightly less than the 1,658 tons which were mined last year. Total yardage at 7,469,100 cu. yd. was approximately 1,000,000 cu. yd. below the previous year's output, due almost entirely to the fact of the subsidiary company's dredge being out of action for the greater part of the year, but the production so lost was approximately offset by the increase achieved by the Peek dredge, and to a lesser extent, by the Ngow dredges in working richer ground. The low recovery of 0.25 lb. per cu. yd. for the Huey Moot property is not typical; this dredge was forced into some of its old tailings to avoid an area of particularly difficult ground in a corner of the property, which has now been passed. On the other hand the production from the Peek leases was above average.

The question of ore reserves has been dealt with adequately in my last two reviews. The figures for the working leases have all been recalculated and adjustments have been made largely by excluding areas unlikely to be profitable in the foreseeable future. The general position remains much the same as previously described, saving only that another year has gone by. Whilst we have been seeking, and shall continue to seek, additional reserves, the prospects of obtaining leases over further large areas of payable ground in Siam or Malaya cannot be described as good.

I mentioned in 1949 that our No. 1 dredge at Ngow had only a short life left. During 1951 this dredge was employed in the reworking of old tailings, but it seems likely that we shall complete this operation by the end of 1952, in which case the dredge will then cease production. Due to its great age—older members will remember that this was the first dredge to be installed by the Company in 1912—it seems unlikely that it can be sold otherwise than as scrap, but we shall endeavour to make the best bargain possible in the disposal of this old friend.

The average price realized on the sale of our product was approximately £721 per ton ore, a rise of about £150 a ton on 1950. This increase accounts for an expansion in revenue of nearly £223,000 which is however to some extent offset by a parallel rise in mining costs of about £103,000, caused mainly by an increase in wages consequent upon the operation for the full year of the Tin Price Bonus scheme (instituted, as Stockholders will remember, in 1950 for the benefit of lower paid workers), and to a lesser extent by the increases in the cost of repairs to and maintenance of our dredges and of fuel.

The net profit before taxation at £489,335 is an increase of more than £139,000 on 1950 and is in fact the highest which has been recorded in your Company's long history. It has however been necessary to provide no less than £311,800 in respect of United Kingdom taxation and the final result, after including the balance brought forward from 1951, is to make available a sum of £214,626. Interim dividends totalling 125 per cent have already been distributed and account for £98,437 of this balance, and it has been considered prudent to increase the Employees' Benefit Provision by £28,000 and to place a further £25,000 to General Reserve, leaving £63,189. From this we are proposing a final dividend of 25 per cent (making 150 per cent for the year) costing £19,688 net which will leave £43,501 to carry forward to the next account.

Current assets total £1,478,989 against £943,123 in 1950, an increase of £535,866 on 1950. This increase is of course not net; current liabilities have also risen from £398,896 in 1950 to £624,196 in the present balance sheet, and the increase in net current assets therefore amounts to £310,566.

Whilst the overall position in the Far East continues to be disturbed, I am pleased to report that our relations with the Siamese Government as a whole and with the various officials whose duties bring them into direct contact with our management on the mines have continued to be excellent, and it will be our constant endeavour that this satisfactory state of affairs shall continue. Our General Manager in the Far East, Mr. M. C. Kain, O.B.E., who has now been in charge of our Siamese and Malayan interests for a full year has this matter very much in mind.

In conclusion I feel that it will be the wish of all our stockholders to extend to Mr. Kain and to his predecessor Mr. Aitken, as well as to the European and Asian staff on the mines, our heartiest congratulations for a successful year.

The report and accounts were adopted.

BANGRIN TIN DREDGING CO., LTD.

SUCCESSFUL YEAR

MR. KENNETH O. HUNTER'S STATEMENT

The Thirty-Second Annual General Meeting of the Bangrin Tin Dredging Co. Ltd. was held on October 23 in London, **Mr. Kenneth O. Hunter,** Chairman, presiding.

The following is an extract from his circulated statement for the year 1951:—

The output of tin ore during the year from dredging was maintained at 1,098 tons as compared with 1,101 tons last year. In addition a further 34 tons was obtained from the re-treating of tin shed tailings, making a total of 1,132 tons of ore recovered, which is the highest tonnage in the Company's history apart from the peak year of 1937 when 1,164 tons were mined. This result has been achieved despite the fact that, as shareholders have already been advised, No. 2 Dredge ceased operations on September 29, 1951, on completion of the treatment of the dredgeable ground in the old Bangrin Area. The main reason for the increase is the higher average value of the ground worked which was 0.72 lb. per cu. yd. as opposed to 0.67 lb. per cu. yd. in 1950; both these values, it should be remembered, are well above the average for the remainder of our leases. As was to be expected, due to No. 2 Dredge closing down, the total of 3,423,000 cu. yd. treated fell somewhat and was lower by 266,000 cu. yd. than the previous year's throughput. The percentage of hours worked was maintained at 85 per cent of the maximum possible, which may be considered highly satisfactory.

The working out of the old Bangrin Area has brought to an end a long and profitable phase in the life of your Company and has freed the No. 2 Dredge for further work elsewhere. In the Sydney Siam area there now remains about 32,000,000 cu. yd. which, at the present rate of dredging, should provide approximately twelve years of working for the two remaining dredges. It goes without saying that the search and investigation of new areas is at all times actively being prosecuted, but the likelihood of proving additional large reserves in Siam or Malaya is admittedly not good. Negotiations for certain promising ground are at present in progress, but may prove to be protracted.

The substantial increase in the world price of tin at the end of 1950 and during the first months of 1951 was not fully maintained, but the satisfactory average of £711 per ton ore was nevertheless realised on the year's production, resulting in a net revenue of £803,783. There were, however, a number of offsetting increases in the costs of maintenance and repairs, of fuel, and most notably, of wages. Nevertheless the profit figure of £405,633 shows an increase of £86,625 on the previous year, and is a record in the Company's history. Unfortunately as £272,730 the amount of taxation also reaches a peak and the net available surplus (including the balance brought forward from the last account) amounts to no more than £173,524 as against £140,139 in 1950.

Current assets now amount to £1,044,874, an increase of about £384,000 on last year. The net rise is unfortunately much less than this; stockholders will note that on the liabilities side taxation due currently and in the future alone amounts to no less than £463,558 and that, including future taxation and the provisions which the Directors have felt it prudent to make, the total liabilities amount to £648,106. This gives a net current assets figure of £396,768 which compares with a similarly computed figure for 1950 of £232,868 giving a net increase of £163,900, which is accounted for very largely by the Siamese War Damage Claim of £143,722 which was settled in May, 1951.

LEADHILLS AND WANLOCKHEAD

Stockholders will remember that an Extraordinary General Meeting was held on July 4, 1952, to determine the future of this project the result of which was inconclusive. Since that date we have been actively engaged in negotiations designed to associate with us other mining concerns of the highest reputation with whom we could confidently proceed jointly to the development of this project. At the date of going to print these negotiations, which have been progressing in a satisfactory manner, have not advanced sufficiently far for me to give any further details, but it is my hope that it will be possible in the near future to present stockholders with a concrete proposition which will appeal to them.

Whilst the overall position in the Far East continues to be disturbed, I am pleased to report that our relations with the Siamese Government as a whole and with the various officials whose duties bring them into direct contact with our management on the mines have continued to be excellent, and it will be our constant endeavour that this satisfactory state of affairs shall continue.

In conclusion I would like to pay tribute to Mr. M. C. Kain, O.B.E., for his able conduct of our affairs in the East, and to our Staff of all nationalities who have co-operated with him in making possible this most successful year.

The report and accounts were adopted.

ANGLO AMERICAN CORPORATION OF SOUTH AFRICA, LTD.

(Incorporated in the Union of South Africa)

ORDINARY DIVIDEND No. 32

SHARE WARRANT COUPON No. 35

With reference to the notice of declaration of dividend published in the Press on September 30, 1952, the following information is published for the guidance of holders of Share Warrants to Bearer:

The DIVIDEND on shares represented by SHARE WARRANTS TO BEARER will be PAID on or after November 14, 1952, after surrender of the appropriate coupons at BARCLAYS BANK (DOMINION, COLONIAL & OVERSEAS), Circus Place, London Wall, London, E.C.2, where listing forms may be obtained.

Coupons must be left four clear days for examination and may be presented any day (Saturdays excepted) between the hours of 11 a.m. and 2 p.m.

Coupons may also be presented for payment in French currency at Banque de l'Union Parisienne, 6 and 8 Boulevard Haussmann, Paris 9e.

Union of South Africa Non-resident Shareholders' Tax will be deducted at the rate of 6.075 per cent from the dividend payable in respect of all Share Warrant coupons. United Kingdom Income Tax will also be deducted from Coupons presented for payment at Barclays Bank (D.C. & O.), London, unless Coupons are accompanied by Inland Revenue declarations. Where such deduction is made, the net amount of the dividend will be 1s. 3.521d. per share, viz:

	Per share s. d.
Amount of Dividend declared	2 0
Less: South African Non-Resident Shareholders' Tax at 1s. 2.58d. in the £	1.458
	1 10.542
Less: United Kingdom Income Tax at 4s. 9d. in the £ on the Gross amount of the dividend of 2s. 5.563d.	7.021
Net amount	1 3.521

By Order of the Board,
W. E. GROVES,
London Secretary.

LONDON OFFICE:
11 Old Jewry, E.C.2.
October 18, 1952.

NOTE: The Corporation has been requested by the Commissioners of Inland Revenue to state:

Under the provisions of Section 348 and the 17th Schedule of the Income Tax Act, 1952, relating to "unilateral relief" from double taxation, South African tax applicable to the dividend is allowable as a credit against the United Kingdom tax payable in respect of the dividend. The deduction of tax at the reduced rate of 4s. 9d. in the £ instead of at the standard rate of 9s. 6d. in the £ represents **a provisional** allowance of credit at the rate of 4s. 9d. in the £. The final rate of credit allowable to a particular shareholder depends on his personal rate of tax; it may be more or less than 4s. 9d. in the £ but must not exceed three-fourths of the personal rate. Revision of the credit involves a corresponding adjustment of the amount shown above as the gross amount of the dividend for United Kingdom tax purposes.

The rate of Dominion taxation applicable to this Dividend and to Dividend No. 31 payable on or after May 20, 1952, is 6s. in the £.

FOR NEW SOUTH WALES PROJECT, required highly qualified and experienced Mining Engineer to undertake General Management Iron Ore Deposit. Electro-chemical qualifications desirable. Write with full details, experience and salary expected to Box Z.D. 119, Deacon's Advertising, 36, Leadenhall Street, London, E.C.3.

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SITUATIONS VACANT ADVERTISED.—*The Notification of Vacancies Order, 1952, must be complied with where applicable.*

RHODESIAN ANGLO AMERICAN LTD.

DIVIDEND No. 32

The Directors to-day resolved to recommend to the forthcoming Annual General Meeting the payment of a final dividend of 5s. per unit of Stock in respect of the year ended June 30, 1952. Particulars of profit and total dividends, together with those for the previous year are:—

	1952 s. d.	1951 s. d.
DIVIDENDS		
Amount per 10s. Unit of Stock:		
Interim	1 3	1 0
Final	5 0	4 6
Total	6 3	5 6
PROFITS		
Group profits before taxation:		
Normal	£19,490,411	£14,819,139
Exceptional (see note below)	1,840,000	—
	£21,330,411	£14,819,139
Deduct taxation	8,059,675	5,627,338
Group net profits for the year	£13,270,736	£9,191,801
Add special credits—taxation provisions no longer required	—	1,554,398
	£13,270,736	£10,746,199
Profits attributable to members of Rhodesian Anglo American Ltd.	£6,176,235	£5,197,704
Profits retained in Subsidiaries' Accounts	2,221,482	1,887,384
Net profits in Rhodesian Anglo American Ltd. Accounts	£3,954,753	£3,310,320
Interim and Recommended Final Dividends	£3,722,880	£3,276,135

NOTE.—The exceptional profits mentioned above arose on sales during the year by two subsidiaries from metal stocks which it will be necessary to reinstate on a return to normal trading conditions; after deduction of taxation these profits have been retained by the subsidiaries in Sales Equalization Reserves.

PAYMENT

If the dividend recommendation is approved, Dividend Warrants will be posted on or about December 10, 1952, to members registered at the close of business on November 6, 1952. The transfer registers in London and Johannesburg will be closed from November 7 to 13, 1952, inclusive.

This dividend recommendation is based on payment being made in United Kingdom sterling. Payment to members registered on the Branch Register will be made in the equivalent Union of South Africa currency, provided that if, in the opinion of the Directors, there is no material difference between the two currencies at the time of payment of the dividend, such members will receive payment at par of exchange.

Dividends payable to addresses in the United Kingdom will be subject to deduction of United Kingdom Income Tax at a rate reduced by a provisional allowance for relief from double taxation. Other dividends will be paid without deduction of tax.

For and on behalf of

ANGLO AMERICAN CORPORATION OF SOUTH AFRICA LTD.

Registrars and Transfer Agents in England

11, Old Jewry,
London, E.C.2.
October 22, 1952.

W. E. GROVES,
London Secretary.

DIVIDENDS

Anglo American Corporation of South Africa 20% *i* (Nov. 13)
Bank of British West Africa 3% *i* (Nov. 13)
Broken Hill Proprietary 10d. (Nov. 26)
Broken Hill South 4s. (Dec. 10)
Burmah Oil 2½% *i* (Dec. 5)
Champion Reef Gold 10% (Oct. 24)
Consolidated Tin Smelters 3½% *i* (Nov. 15)
Daffo (N. Nigeria) Tin 12½%*
Electrolytic Zinc of Australasia 30%
Electrolytic Zinc Co. of Australasia, Pref. and Ord. 1s. 6d. (Dec. 9)
Emperor Mines 6d. (Dec. 19)
General Mining & Finance 10% *i*
General Tin Investments 3% *i* (Nov. 12)
Imperial Chemical Industries 5% *i*
Kinta Tin Mines 10% *i*
Kuala Kampar Tin 3s. (Nov. 12)
Manganese Bronze & Brass 3½% *i*
Metal Traders 37½%
Minerals Separation 20% *i* (Nov. 7)
Mufulira Copper 26¼%
Mysore Gold 3½% (Dec. 5)
North Broken Hill 100%
Nundydroog Mines 3½% (Nov. 14)
Plna Copper Mines 10%
Rhodesian Anglo American 5s.
Rhodesian Selection Trust 25%
Rhokana Corporation Ord. and A. 35s.
Roan Antelope Copper 32½%
Royal Bank of Canada 25c.
South African Torbanite 12½%
Southern Kinta Consolidated 25% (Oct. 31)
St. John d'el Rey Mining 2½% *i* *
Stream-Line Filters 5%
Tanjong Tin Dredging 15% *i*
Thomas W. Ward 15%
Transvaal & Delagoa Bay Investment 4s.
Triefus & Co. Pref. Ord. 20% (Nov. 1)
Union Corporation 20% *i**
Zambesia Exploring 4% *i*

i interim * Tax free

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ANGLO-TRANSVAAL CONSOLIDATED INVESTMENT CO. LIMITED

Mining Companies' Directors' Reports for Quarter Ended September 30, 1952

Following are the reports on work done during the quarter ended September 30, 1952

ANGLO-TRANSVAAL COLLIERIES, LIMITED

The Sales Output of the Subsidiary Collieries controlled by this Company for the quarter ended September 30, 1952, totalled **253,398** tons.

EASTERN TRANSVAAL CONSOLIDATED MINES, LIMITED

The total tonnage treated during the quarter ended September 30, 1952, by the four gold mines operated by this Company, amounted to **54,625** tons, resulting in a Working Profit (including Sundry Revenue) of **£50,533** for the quarter.

Revenue from the sales of gold at higher than standard prices, sold for manufacturing purposes during the three months July to September, inclusive, amounted to **£4,066**, making a Total Profit for the quarter of **£54,599.**

The Profit, as shown above, does not take into consideration the amount, estimated at **£22,000** for the quarter, payable to the Government in Mining Taxation.

Capital Expenditure for the quarter amounted to **£11,564.**

SHAFT SINKING AND EQUIPMENT

AGNES GOLD MINE—The Ivy Shaft was Sunk **18** ft. during the quarter to a total depth of **1,116** ft. Shaft sinking has been temporarily suspended at this depth until a winze, now being sunk from the bottom levels of the mine, has intersected the development from the Ben Lomond Tunnel.

SHEBA GOLD MINE—Timbering of the Zwartkopje Vertical Shaft is in progress.

GENERAL—A total of **395** ft. of development from the Ben Lomond Tunnel was accomplished during the quarter, bringing the advance in connection with this work to a total of **4,527** ft.

Progress was made with preparatory work on the installation of a further unit at the New Consort Power Station.

MERRIESPRUIT (ORANGE FREE STATE) GOLD MINING COMPANY, LIMITED

SHAFT SINKING

No. 1 VERTICAL SHAFT was sunk **404** ft. during the quarter to a total depth of **3 324** ft. The formations traversed were Ventersdorp Sediments to a depth of **3,170** ft. and quartzites of the Upper Witwatersrand System from this depth. In addition, **53,453** cu. ft. were excavated in the cutting of the second station at a depth of **3,055** ft. below the collar, together with the brow box to serve this station.

The shaft was concrete lined to a depth of **3,284** ft., of which **401** ft. were accomplished during the quarter. The intersection in pilot holes of water-bearing fissures, requiring cementation, considerably delayed sinking operations.

SHAFT EQUIPMENT AT No. 1 SHAFT

Work has been completed on the initial portion of the permanent steel headgear and on the brick panels of the permanent winder house.

The service winder house was completed and the erection of this winder was commenced.

LABOUR

The Labour Strength at the end of the quarter was: Europeans **48**, Natives **422.**

CAPITAL EXPENDITURE

Capital Expenditure amounting to **£127,050** was incurred during the quarter on shaft sinking, buildings and plant.

The total Capital Expenditure, including preliminary expenses, incurred to September 30, 1952, amounted to **£2,184,339.**

MIDDLE WITWATERSRAND (WESTERN AREAS), LIMITED

The Company retains its interests in Mineral Rights in the Virginia and Odendaalsrus Districts and in Mineral Option contracts in the Odendaalsrus and Winburg Districts of the Orange Free State, as well as in Mineral Rights and Mineral Option Contracts in the Klerksdorp District of the Transvaal.

The following is the report on work done during the quarter ended September 30, 1952.

DRILLING OPERATIONS

During the quarter a total of **6,893** ft. was drilled in **6** boreholes.

Borehole No.	Drilled on joint account with	Farm	Depth at September 30, 1952 Ft.	Formations traversed during Quarter: Borehole Depths (ft.) From	To	Description	Reefs intersected: Reef	Depth ft.	Value dwt.	Corrected width in.	In.-dwt.	Remarks
VDH. 6/51	General Exploration Orange Free State	Van den Heeversrust No. 419 District Odendaalsrus	6,466 Original borehole completed on February 18, 1952. Deflections in progress									Progress delayed by the intersection of fissured ground.
TL. 30/52		Klerksdorp Townlands No. 44, District Klerksdorp	6,947 Original borehole completed on July 24, 1952. Deflections in progress	6,230	6,491	Witwatersrand System	Reef in Gold Estates Zone	6,503	3.4	12.4	42	Original borehole
				6,491	6,506	Gold Estates Reef Zone	Reef in Gold Estates Zone	6,506	1.0	11.3	11	1st Deflection
				6,506	6,947	Witwatersrand System. Main Bird Series	Uncorrelated	6,608	0.88	26.7	23	Original borehole
							Uncorrelated	6,612	0.91	23.0	21	1st Deflection
TL. 35/52		Klerksdorp Townlands No. 44, District Klerksdorp	5,144 Original borehole completed on July 22, 1952. Deflections in progress	4,225	4,277	Ventersdorp Lava	Uncorrelated	4,833	4.4	11.3	50	Original borehole
				4,277	4,700	Witwatersrand System	,,	4,833	6.1	10.9	66	1st Deflection
				4,700	4,701	Gold Estates Reef Zone	,,	4,845	3.41	14.5	49	3rd Deflection. (2nd Deflection abandoned)
				4,701	5,144	Witwatersrand System. Main Bird Series	,,	4,841	3.3	10.3	34	Original borehole
							,,	4,841	2.4	6.3	15	1st Deflection
							,,	4,850	7.4	10.9	81	3rd Deflection

Borehole No.	Drilled on joint account with	Farm	Depth at September 30, 1952 Ft.	Formations traversed during Quarter: Borehole Depths (ft.) From	To	Description	Reefs intersected: Reef	Depth ft.	Value dwt.	Corrected width in.	In.-dwt.	Remarks
TL. 36/52		Klerksdorp Townlands No. 44, District Klerksdorp	6,480 Original borehole completed on September 26, 1952. Deflections in progress	4,164	5,601	Ventersdorp Lava	Uncorrelated	6,123	2.3	10.7	25	Original borehole
				5,601	6,048	Witwatersrand System		6,129	3.1	10.7	33	Original borehole
				6,048	6,089	Gold Estates Reef Zone						
				6,089	6,480	Witwatersrand System Main Bird Series						
TL. 38/52		Klerksdorp Townlands No. 44, District Klerksdorp	208 Completed on July 2, 1952	161	208	Witwatersrand System (Vaal Reef Footwall)						
TL. 39/52		Klerksdorp Townlands No. 44, District Klerksdorp	600 Completed on August 18, 1952	0	376	Ventersdorp Lava						
				376	600	Witwatersrand System						

In addition, the Company is participating in the drilling of the following boreholes in the Orange Free State:—

Borehole Number	Farm	Drilled by
ERK.1	Energie No. 896, District Odendaalsrus	Free State Development and Investment Corporation Ltd.
BH.2 (RD.2)	Rosedale No. 898, District Odendaalsrus	General Exploration, Orange Free State Ltd.
BH.3 (SB.3)	Spes Bona No. 921, District Odendaalsrus	General Exploration, Orange Free State Ltd.

NEW KLERKSDORP GOLD ESTATES, LIMITED

PRODUCTION

Tons milled: **34,590** tons, yielding **3,969.62** f.oz.

Revenue from Gold	£49,527
Working Costs	£47,855
	£1,672
Sundry Revenue	£1,391
Working Profit for quarter	£3,063
Working Costs per ton milled	27s. 8d.
Working Costs per f.oz. recovered	241s. 1d.

In addition to the above Revenue, **£1,034** accrued in respect of increased revenue from sales of gold at higher than standard prices, sold for manufacturing purposes during the three months July to September, 1952, inclusive.

The Working Profit for the quarter, as shown above, does not take into consideration interest on loan amounting to **£1,506** for the quarter.

No liability was incurred for Mining Taxation payable to the Government in respect of the profits earned for the quarter.

CAPITAL EXPENDITURE

The expenditure on Capital Account for the quarter amounted to **£3.**

DEVELOPMENT

The total footage advanced during the quarter amounted to **1,929** ft. Of **1,610** ft. sampled, **595** ft., equal to **37.0** per cent, were classed as payable at an average value of **4.19** dwt., over a channel width of **34** in., equivalent to **144** in.-dwt.

(The above results are based on actual sampling. No allowance has been made for adjustments necessary in the valuation of the corresponding Ore Reserve.)

RANDLEASES (VOGELSTRUISFONTEIN) GOLD MINING COMPANY, LIMITED

PRODUCTION

Tons crushed: **555,000,** yielding **92,562** f.oz.

		Per ton crushed
Revenue from Gold	£1,154,826	41s. 5d.
Working Costs	£969,687	35s. 6d. (214s. 1d. per f.oz.)
	£185,139	5s. 11d.
Sundry Revenue	£12,500	6d.
Working Profit for Quarter	£197,639	6s. 5d.

Working Costs per ton, **35s. 6d.,** include **6s. 1d.** in respect of development expenditure.

In addition to the above Revenue, **£25,544** accrued in respect of increased revenue from the sales of gold at higher than standard prices, sold for manufacturing purposes during the three months July to September, 1952, inclusive.

The Working Profit for the quarter, as shown above, does not take into consideration the amount, estimated at **£70,000** for the quarter, payable to the Government in Taxation and as its share of the profits in terms of the Mining Lease. [P.T.O.

CAPITAL EXPENDITURE

The expenditure on Capital Account during the quarter amounted to **£19,975.**

SHAFT SINKING

Kimberley Reef No. 2 Incline Shaft was advanced **232** ft. to a total length of **1,371** ft.

DEVELOPMENT

A total of **20,975** ft. of shaft sinking and development was accomplished during the quarter, of which **12,360** ft. were sampled, showing **6,525** ft., equal to **53** per cent. as payable.

Payable reef disclosures were distributed as follows:—

Reef	Footage Sampled	Payable				
		Ft.	Percentage	Channel Width (in.)	Channel Value (dwt.)	In-dwt.
Main Reef	2,590	1,090	42	33.9	6.55	222
Main Reef Leader	4,170	2,820	68	11.6	25.76	299
South Reef	2,050	1,095	53	14.7	16.67	244
Total Main Reef Series	8,810	5,005	57	17.1	15.78	270
Bird Reef	1,420	840	59	44.3	3.63	161
Kimberley Reef	2,130	680	32	56.5	4.07	230
Totals and Averages	12,360	6,525	53	24.7	10.19	252

(The above results are based on actual sampling. No allowance has been made for adjustments necessary in the valuation of the corresponding Ore Reserve.)

VILLAGE MAIN REEF GOLD MINING COMPANY (1934) LIMITED

PRODUCTION

		Per ton treated
Tons treated: **101,100,** yielding **15,827** f.oz.		
Revenue from Gold	**£197,968**	**39s. 2d.**
Working Costs	**£153,068**	**30s. 3d.** (**193s. 5d.** per f.oz.)
Working Profit for quarter	**£44,900**	**8s. 11d.**

Working Costs per ton, **30s. 3d.,** include **6s. 0d.** in respect of development expenditure.

In addition to the above Revenue, **£4,575** accrued in respect of increased revenue from the sales of gold at higher than standard prices, sold for manufacturing purposes during the three months July to September, 1952, inclusive.

The Working Profit for the quarter, as shown above, does not take into consideration interest on Loans, amounting to **£513** for the quarter, nor the further amount, payable to the Government in Mining Taxation, estimated at **£21,000** for the quarter.

CAPITAL EXPENDITURE

The Expenditure on Capital Account during the quarter amounted to **£223.**

DEVELOPMENT

9,133 ft. of development were advanced during the quarter, and **5,477** ft. of old drives and crosscuts were reconditioned.

In addition, **1,159** ft. of underground diamond drilling were done as an aid to development.

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SHAFT SINKING

No. 2 VERTICAL SHAFT—Shaft Sinking operations were recommenced on August 29, 1952. The Shaft was sunk **235** ft. in quartzites of the Upper Witwatersrand System to a total depth of **3,144** ft. The "B" Reef was intersected between shaft depths of **2,943** ft. and **2,952** ft., with negligible values. The Shaft was concrete lined to a depth of **3,136** ft., of which **236** ft. were accomplished during the quarter.

SHAFT EQUIPMENT AT No. 1 SHAFT

Work on the erection of the **4,400** H.P. Permanent Electric Winder is nearing completion.

Work was commenced on the erection of the steelwork for the conveyor gantry from the headgear.

DEVELOPMENT

Development at No. 2 Shaft was stopped temporarily on August 26, 1952, in order to expedite the sinking of the shaft to its final depth.

Development at No. 1 Shaft was considerably retarded due to the intersection in pilot holes of water-bearing fissures requiring cementation.

A total of **5,685** ft. of development was accomplished during the quarter and, in addition, **46,325** cu. ft. were excavated in pump chambers, sumps and in service bays.

The following are the results of the quarter's development:—

	No. 1 Shaft	No. 2 Shaft	Totals and Averages
Footage Advanced	3,746	1,939	5,685
Footage on Reef	2,731	401	3,132
Footage Sampled	2,645	395	3,040
Payable Footage Sampled—			
Payable	2,010	135	2,145
Percentage Payable	76.0	34.2	70.6
Channel Width—In.	43.5	45.1	43.6
Channel Value—Dwt.	7.54	4.75	7.36
In.-dwt.	328	214	321

(The above results are based on actual sampling. No allowance has been made for adjustments necessary in the valuation of the corresponding Ore Reserve.)

MINE BUILDINGS AND PLANT

The initial portion of the permanent workshops was completed. Work is proceeding on the extensions to the Electricity Supply Commission sub-station at No. 1 Shaft.

LABOUR

The Labour Strength at the end of the quarter was: Europeans **233,** Natives **1,332.**

CAPITAL EXPENDITURE

Capital Expenditure amounting to **£305,448** was incurred during the quarter on shaft sinking, buildings and plant.

The total Capital Expenditure, including preliminary expenses, incurred to September 30, 1952, amounted to **£5,363,063.**

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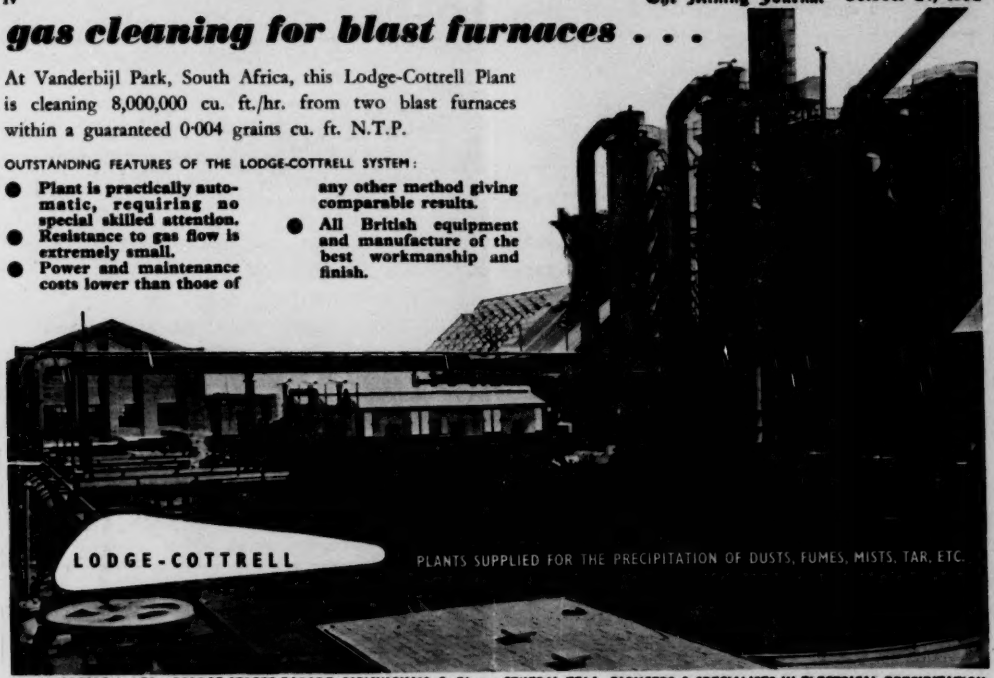

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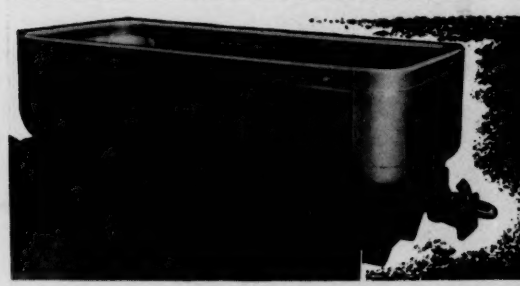

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